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CANADIAN CHEMISTRY AND METALLURGY

Formerly "Canadian Chemical Journal."

THE OFFICIAL JOURNAL OF THE CANADIAN INSTITUTE OF CHEMISTRY

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CANADIAN CHEMISTRY AND METALLURGY

THE OFFICIAL JOURNAL OF THE CANADIAN INSTITUTE OF CHEMISTRY

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EDITORIALS

1921

WE wish everybody a Happy New Year.

The world is not yet exactly comfortable or at its ease, but there are reports from Europe and America of fine harvests and improved production. That should help a whole lot if the matter of distribution and price can be handled for the benefit of all, if the nations that have, distribute to those that have not, and if political considerations can be made to give way to the people's needs.

The international finance situation seems to be out of the stage of hysteria and while still inclined to have some temperature, the higher-interest tonic and internal-loan bandage seem to be having a soothing effect.

The outlook is misty, but several points in the landscape can be seen. Capital must borrow at home, and sellers be content with lower prices. That portion of labour referred to rather oddly as restless, is beginning to perceive that peace and happiness are more consistent with less rest.

We are confronted with the accomplishment of the British coal miners who have not only got their extra two shillings, but will soon have another. It was an expensive lesson but it will have been worth while, if the radicals take it to heart.

The chemists of the British Empire will meet in Canada and round off their visit in a fellowship gathering with their kin in the United States. This will mean much for goodwill, increase our mutual sympathies, and strengthen the Anglo-American tie.

"CANADIAN CHEMISTRY AND METALLURGY"

IT is the privilege of papers to change their names. We may have some readers who might not notice at first glance that the "Canadian Chemical Journal" has become "Canadian Chemistry and Metallurgy." To be very frank with all our readers, we must say that we have had much advice one way and another in this matter, and now that we have made our decision, some of the reasons which lay behind the action may be considered. Needless to say we will always remain chiefly concerned with the Canadian chemist in all the parts he plays in our industrial life, and those specialized raw or finished products with which he deals.

The founders of the "Canadian Chemical Journal" were well aware that they were attempting a large order when that paper was first launched. The broadest and most embracing name was necessary. It must be remembered that for Canada this was a new field. No publication of a chemical nature had been attempted previously. There was no distinctly Canadian voice to speak up as occasion demanded among the throngs of well established chemical journals of other countries. The first mission of the paper has been met. It has given a voice to Canadian chemistry which is now recognized abroad and has become a factor in the industrial chemical life of the Dominion. It was early recognized that the name "Canadian Chemical Journal" classified the paper with a variety of publications abroad whose fields were somewhat different. As an industrial engineering and business journal, it was not in the same mould as the Journal of the American Society, or European journals entirely devoted to original literature of a specialized research nature. There is a place for a Canadian Chemical Journal, and eventually a sufficient number of suitable articles may be forthcoming and available to such a paper for the issuing of a quarterly entirely devoted to original Canadian work. Until now the Royal Society subsidized by the Dominion Government is alone able to give even a narrow circulation to such papers, and Canadians for the most part contribute to the long established journals of the United States and England.

Other factors in the case influenced the decision. It is obvious that the paper is a journal. This need not be stressed month by month. It is in keeping with the spread of common knowledge, and the significance of things that the word engineering in relation to chemical operations need not be emphasized as much now as may have been necessary a few years ago. From the Canadian point of view, if there is a minor branch of the whole field that might with reason be given some prominence, it is metallurgy. In a broad way everyone knows that metallurgy is only one branch of chemistry as far as a paper classification goes, and yet the field must necessarily employ a large number of our best trained men, if progress is to be made in the full development of our resources. By such a process of thinking, if not reasoning, it has been decided to follow the development of chemistry as a whole, and in metallurgy in particular, under the heading "Canadian Chemistry and Metallurgy." This has been in reality the function of the paper previously, and no great alterations in the nature of its contents are to be expected.

Such a paper must leave a field uncovered. This is one wherein chemistry plays a large part, but

the inroads of the chemist in some branches have not been large. As a supplement to "Canadian Chemistry and Metallurgy," but at the same time under different editorial management, it is proposed to publish a paper devoted to color interests in textile, paint, ink, rubber and paper fields. This supplement will be known as the "Canadian Dyer & Color User." Thus may the various interests of applied Canadian chemistry and industries involving technical control be attended to more carefully in future.

THE UNIVERSITIES.

LAST month we had the pleasure of congratulating McGill University on the successful accomplishment of its centennial funding campaign. The magnificent result of that campaign indicates the value placed on University achievement and upon maintaining its functional healthfulness.

The Ontario Government has appointed a commission to report upon a basis of financial support for the University of Toronto, Queen's and Western Universities.

It would be a very satisfactory development if it were found that Ontario could have three great Provincial Universities all just what they should be as to staff and equipment. That would be a good investment and no doubt Ontario could pay for it, if all were agreed upon the proposition and its value.

Judging from past experience we can only say regretfully that the people of Ontario, in common with the people of other Provinces and the United States have not yet reached that altitude. It is doubtful if any of our Provinces could support in any degree of adequacy more than one university with the available provincial revenue.

Again if there were no question of funds there would be the questions of personnel, and of equipment for research and post graduate work. The advantage of measuring up to the high standard of a major university should not be lost to view in an appeal to the sentiment of local loyalty or the wish to have other communities receive the benefits of university life. There is much work for the smaller universities and a share of financial support should be given them.

One of the developments of the smaller university is that of specializing in some line, frequently in connection with the natural resources of its neighbourhood, such as mining, ceramics or agriculture. The Kingston School of Mines is well equipped and Queen's men who have taken mining courses have ranked high. The Kingston School of Mines was established long before the Cobalt discoveries and is, therefore, senior in its field, though the University of Toronto naturally must take up mining owing to its geographical location. Queen's Laboratories, however, have made notable contributions to Canadian metallurgy. Western University has for many years maintained a medical faculty whose graduates rank well in their profession. Both these universities have good Arts courses, and it might be suggested that Queen's be supported by the Province in Arts and Mining while Western is supported in Arts and Medicine. But what about the Northland and the Western end of the Province? Would it not be well to establish some educational centre say at Fort William, Port Arthur or Sault Ste. Marie? Thus it would go on, until funds were so attenuated that none would be able to maintain decent research equipment, and salaries would approach the vanishing point.

Great efforts, therefore, should be made to keep universities of established prestige, large investment and strong personnel, in the leading position achieved by seniority, location, hard work and contribution to science, letters and art.

The location of Toronto as the Provincial University of Ontario, has never been seriously questioned, and it appears to be the duty of Ontario to keep its Provincial University in the most advantageous position in all respects before contributing to others, however great their admitted needs. It should therefore be kept in mind that Toronto is only the name of the University. The city does not directly support it. It is a Provincial institution, and while it would be undesirable in view of tradition, sentiment, and location, to change the name, it is the University of Ontario in effect.

A university is much more than a teaching institution. It must be able to contribute to the general welfare by research and discovery. These require much apparatus and exceptional human equipment, which cannot be readily multiplied, nor could they with any satisfactory result be dispersed.

One thing at a time, done well is good policy in this case.

AN OPPORTUNITY FOR COURAGE.

POLITICAL planks seem to be changing in texture. It is now required that they be very specific and more definite than heretofore. We would suggest a new one for the present Government at Ottawa.

We print in this issue a letter outlining the necessity for Governments giving serious thought to the fundamental reasons behind prosperity and industrial advances. If the present Government wishes to really start a movement which will meet with united support from agricultural and manufacturing interests, they should go in for

specific and definite Government industrial research.

We distinguish this from anything they have done in the past. We do not clamor for another Mines Branch or Health Department. These are most valuable and have their work to do whenever they are fully staffed. At the best they are not self-starters, but rather avoid such work at times, as it is not their function to carry on research, except in a very limited way.

Supposing the lack of action on the part of the cabinet and members be excused until the present, because of other most pressing business. This would pass as reasonable until now; but in the future and during the next session, it will be hard to believe it. Now would seem to be the time to drum hard on our new political plank. We would suggest that the Act to Establish a National Research Institute be put through, and that the Government vote at least $10,000,000 for a start as a nest-egg, as it were, towards the work which might be undertaken properly in organizing our industries and developing our resources on a scientific industrial basis. We would further suggest a sufficient measure of public ownership of experimental works of a size large enough to demonstrate any process, not ceasing the undertaking until the product could compete in world markets.

If Berlin ever heard that Canada was devoting about twice the sum to her whole resources that Germany would put into the production of a single product, we are certain that she would forget her idea of conquering the world by research. On the other hand, if word gets through that we may spend half a million there is some doubt if it will be the knock-out blow which we might hope for.

We believe that practically all manufacturers as well as the best brains in the labor party and those farmers who appreciate that wheat grows from seed, would all either back this movement or wish they could, provided the present Government at Ottawa had courage enough to push it through and make something out of it. As a rider to the suggestion we would approve the appointment of a few ordinary persons to direct this work, preferably those whose academic experiences have been tempered by close contact and responsibility in dividend producing enterprises.

LUBRICATING WITH ACIDS.

A CONSIDERABLE amount of publicity has been given the results of work done by H. M. Wells and J. E. Southcombe on the theory and practice of lubrication.

The so-called "germs" consist of specific fatty acids in a form which, when mixed in small amounts with mineral oil will lower the consumption of oil and create a most desirable lubricant, displacing fatty compounded oils.

This is but another case where a most desirable piece of work has been carried through to conclusion in England, bringing out the progress possible through good observation, coupled with accurate systematic work.

Much as we know of forces and friction, it is not easy to explain "oiliness", or state what properties create "slippery" mixtures. The measurement of surface tension of an oil against air is not much evidence on the relations existing between an oil and a metal bearing. By a process whereby the surface tension of the oil is measured against an immiscible solvent, it was found that a distinct physical difference between mineral and saponifiable oils could be noted quite independent of density and viscosity. After further running it down, it was found for water and fatty oils that the presence of a light content of free fatty acid lowered interfacial tension.

Whether or not oiliness depends on the chemical forces playing between the active part of the oil molecule and the solid surface, it is evident that close observation of experimental work may greatly assist good practice in a thousand factories, and that the chemist stands justified. His enquiring mind may cause hours of worry to those brought up to the rule of thumb, but if he desires encouragement, the work of these men in the lubrication field as given elsewhere in this issue should be appreciated.

QUALITY, DEMAND AND SERVICE.

THE market is turning up its nose now at stuff it was praying for six months ago, says the manufacturer. No doubt the market is finicky, but when one can choose there is little doubt of the choice running to the best and the cheapest. What the market does to your goods now, if it can buy at all, depends on what you did to the market when it had to take what you gave it.

Several commodities have been in the position, fortunate for the producer, of being scarce and having little or no competition. Coal is typical in some ways, through conditions have not been simple.

Coal is purchased for heating purposes, either directly or to produce steam. The obvious way to value coal would, therefore, be to determine its heating value. When the analyst criticizes coal on the basis of its deficiency in thermal units, he is told that it makes no difference as "you have to take what they give you." We expect that the coal situation will not be altered for a long while, but there are other cases quite similar, whose turn

has come now and these have to face the harvest of their own sowing in a measure. If the market was bullied where it should have been served, its attitude can be guessed.

When the buyer was afoot and the seller in the saddle, it was the seller whose course determined the future. Few policies have paid better than close routine control, uniform quality, and service. If that course was pursued when there was a seller's market, the friendships then made will help the seller to-day, and it would be poor policy to cut the expense of technical control now when the market is critical.

We regret to note a tendency in the direction of reducing technical staff. It is the old trick which we had thought had been fairly well done away with. Any plant that lets real chemists go at the present time is on a "hunger strike" for sure. Even if the usual production is curtailed there are many things that need adjustment or examination not possible in the course of full time production. There are of course varieties of technical men, but the kind we have in mind could not safely be dispensed with, even if he is not working to the limit on routine, any more than fire insurance.

If you have good technical men, chemists or engineers who know your plant and who get along with your superintendents it is very poor economy to let them go if at all possible to retain them. Very often he can and will be able to do other things about the plant and would be pleased to get a more intimate working knowledge of processes in that way.

BRITISH EMPIRE EXHIBITION 1923.

THIS is one of the coming events which looms before us, not with a shadow, but as a bright spot. It is partly the result of a proposal made by Lord Strathcona before the war.

At a meeting under the auspices of the British Empire League, which was attended by prominent representatives of the Overseas Dominions, it was decided to move for an exhibition in 1921, but it has since been decided that an exhibition on the scale anticipated cannot be held before 1923. The site is being considered in consultation with the President of the Royal Institute of British Architects. The Prince of Wales has consented to act as chairman of the General Committee.

The British Government has agreed subject to the sanction of Parliament to contribute 100,000 pounds, and also subject to the condition that other guarantees of not less than 500,000 pounds be obtained.

All regulations in connection with the exhibition to be subject to the approval of the Exhibition Division of the Department of Overseas Trade. It is hoped by the Prince of Wales and the Executive Council, that at least £1,000,000 will be guaranteed.

Sir George Perley, Canadian High Commissioner, was present and expressed approval as did also the Australian representative. Canadians should begin to lay plans for an event of such importance to trade development in the Empire.

SODIUM SULPHATE FEVER.

THE province of Saskatchewan has become afflicted with a new disease. We have called it sodium sulphate fever. While it may extend slightly beyond the limits of the province, it is particularly strong in this district. Everyone is having lake deposits analyzed and is about to become wealthy over night by the simple process of digging up sodium sulphate. Some notice is being taken of this by provincial authorities with a view to warning the unwary that the mere presence of large or small deposits of natural salts of this nature does not necessarily insure the immediate swelling of personal bank accounts.

This resource is one which, if handled properly and in a co-operative manner, may mean considerable to the province. Some companies are proceeding along correct lines and are studying the problems of recovery and marketing. To begin with, freight rates are not favorable to say the least, and as there are other sources of natural and synthetic salts, the development of a deposit calling for large outlays should be thoroughly considered. Stock exploitation should be avoided, and the Govermnent is well advised to warn the public generally speaking. At the same time, some of the depcsits at least are bing profitably developed, and for those who are honest and know their business the opportunity for investment seems to be sound. This is a new opportunity to develop a resource properly and we trust it will be handled sanely.

NOTES ON CO-OPERATIVE SCIENTIFIC RESEARCH

Editor "Canadian Chemistry and Metallurgy":

Sir,—Science, the systematic observation of facts, is purely experimental. Stated in the words of Sir W. Hamilton, "It" is called empirical or experimental because it is given to us by experience or observation and not obtained as the result of inference or reasoning."

Research is experimentation. "Experimentialism,—the doctrine that experience is the source of all knowledge. Experientialism is, in short, a philosophical or logical theory not a psychological one,"—Robertson.

Only in recent years has any amount of attention been given to co-operative and correlated scientific and industrial research by either governments or industrial organizations. The pioneers of governmental research are the Germans,—only in dire distress did their enemies adopt the Hun methods of co-operation which made them and their allies so formidable in the early years of the war. Now in times of peace when this correlated and co-

operative program of scientific research should be perfected it is thrown aside as needless.

No Government is so effected with psychological inertia as the despised and hated Germans. Still, the scientific program of research for that country remains intact, nay, far stronger and greater to-day than ever before. If Germany as a nation 'comes back' it will be because of her scientific program, her industries making use of the sciences, especially chemical technology. Could not some of the recent enemies of Germany learn a permanent lesson from recent war experience or will it require another war to shake off the heavy coat of self-security?

"The chemical arm is the arm of the future," says Professor F. Francis. The nation possessing the highest degree of chemical specialization and resources possess the greatest arm of war ever discovered. From a standpoint of public safety no government can overlook this important fact.

The great problem facing the British Empire to-day is that of Government co-operation with industrial companies controlling the chemical resources and establishments. The success of a method or process, the success of any form of research undertaken by an industrial corporation is a material success and gain for the Empire. Likewise the successful application or use of a product by the government is an encouragement to the chemical industry. Truly no greater field for co-operation in the public good and safety can be found than that which should exist between chemical and allied industries on one hand and the Government on the other.

As an aid to the chemical industries many of which are suffering from the effects of reconstruction, why not a Bureau of Chemistry? Are there not Bureaus and Branches of Mines, and other useful divisions of governmental activities devoted to the different industries? Why not a centralized semi-government trust for the chemical industries? The annual cost of maintancee for these enterprises would be neligible in comparison with the increased efficiency which would be made possible by these aids.

The Bureau of Chemistry should be a non-political branch of the Government, while the Chemical selling organization should be Empire wide. Both organizations would find a place of activity in either times of peace or war.

For solving problems involving experimentation and research which cannot readily be undertaken in the plant laboratory, why not a centralized Research Institute, which could be supported partly by the Government and co-operate members? This idea of co-operation by scientific industries is embodied in the Allied Academy of Scientific Research which was organized last year with a membership of thirty-two associates. The organization intends to establish a co-operative laboratory next year (1921) and will devote its full attention to solving problems occuring in practical work which causes inefficiency.

A similar plan was made use of by the late Dr. Richard MacLaurin, in raising the eleven millon dollar endowment fund of the Massachusetts Institute of Technology. Each industrial contributor to the fund who donated a certain amount is entitled to the use of the consulting and research division composed of members of the faculty of the Institution. This latter plan, while no doubt successful as far as the 'Tech' is concerned, cannot serve such a wide field of usefulness as might be expected. One of the obvious reasons for this is that most if not all of the faculty members have sufficient work to do without undertaking intensive research for industrial companies.

Co-operative laboratories for research, if properly supported by active members of specialized industries, could accomplish a great amount of investigation which under ordinary circumstances would remain untouched. The laboratories of universities, colleges, and technical schools could be organized on a specialized basis, assigning different divisions of research to the different institutions. Here the problem of research in educational centers again manifests itself. Should the research be carried out by the faculty or under faculty supervision, or by independent investigators. In this respect fellowships offering sufficient compensation to secure reliable investigators should be bestowed upon suitable applicants, who could be connected with the educational institution but in an unofficial capacity. Some universities offer graduate scholorships for the investigation of certain problems and leading to higher degrees. Usually however,, three-fifths to four-fifths of the time so occupied is spent in abstract subjects different from the problem under question. Why make a farce of the investigation of a scientific problem to obtain a degree? The" scientific investigator should be a student not a schclar, "says M. L. Hodges.

The Government should maintain highly specialized laboratories for solving military and chemical war problems, the necessity of which cannot be denied. The Government should aid, co-operate with, and encourage chemical industries, scientific institutions, and co-operative laboratories. Lawmakers should awake to the fact that no money is ever perpetually lost when spent in scientific pursuit.

Companies and industrial corporations should be alive with the fact that 'trade-secrets' are in most cases relics of the bronze age. They should realize the saving effected by scientific control and scientific methods. Officials of Chemical industries should learn to co-operate with their fellow-competitors, and more fully realize that the world is large enough for everybody's business if conducted on the right basis.

Every great discovery and invention was the result of research and experimentation. Research makes discoveries, but experimentation perfects them. What may be a research problem of to-day may become an industrial consideration to-morrow by systematic experimentation.

Yours truly,
Roy Franklin Heath,
Billings, Montana, Dec. 8, 1920

UNITED STATES POTASH PRODUCTION.

The American potash industry is reported to be in a more promising condition than at any time since the Armistice, and production in 1920 is expected to exceed even that of 1918. The situation has been improved by the refusal of the German syndicate to quote prices at American ports. This throws the burden of securing ships, negotiating freight rates, and absorbing demurrage on the American purchaser. On the other hand, the producers in the States have had to face labour difficulties and trouble in obtaining materials. In Nebraska, the abnormal rainfall has so diluted the brine as to make a much greater amount of. evaporation necessary just at a time when fuel prices are at their highest. Large new plants are being built at Searle's Lake, Marysvale, Utah, and at New Brunswick N.J. Searle's Lake producers have, it is stated reduced the borax content of their potash to 0.5 per cent. In that connection it is pointed out that the borax content of the Searle's Lake potash never was so great as to be hurtful when used under normal conditions, damage resulting only where prolonged drouth prevented the washing-out of the borax. The lowering of the borax content is a very simple matter, and could have been done before it had been known that it possessed an element of danger. The company which produced the potash which caused some small damage to crops is not selling its potash for fertilizer purposes this year, its entire output having been purchased by chemical users.

ZINC FOUND NEAR PORCUPINE.

An 18-inch wide vein of sphalerite containing 30 per cent. zinc has been discovered north of Porcupine in Northern Ontario. While some have discredited the report as not important, it would appear that such a good showing has possibilities and should not be adversely criticised until further reports are received.

The History of Helium and its Production

Discovery of Helium, Occurrences and Properties---Work of Professor McLennen in England and Canada

By R. T. ELWORTHY*

ONE of the many remarkable contributions of scientists to the art of modern warfare was the suggestion to use the hitherto rare gas, helium, for the inflation of balloons and airships and its ultimate production on a large scale.

This paper attempts to outline the history of the discovery of helium and the development of its commercial production. The story should be of especial interest to Canada for two reasons; in the first place, a Canadian—Professor J. C. McLennan of the University of Toronto—was largely responsible for the British development and in the second place Canada is the only source of supply in the British Empire.

History of Discovery.

To fully appreciate the evolution of the discovery of helium one should go back as early as 1785 to experiments of Cavendish by which he was seeking to prove that the greater part of what was then called "phlogisticated air"—our atmospheric nitrogen—was identical with a constitutent of nitric acid.

In these experiments he passed sparks through a mixture of air and oxygen over alkali and after three weeks' work turning the handle of a frictional electric machine there still remained a small bubble of gas that refused to dissolve. This fact he duly noted but could not explain.

Many years after, in 1892, Lord Rayleigh was engaged in a very careful determination of the densities of the common gases. Nitrogen was investigated in its turn and the weight of volumes of nitrogen prepared in several different ways was measured. Lord Rayleigh soon noticed a discrepancy in the results. The weight of a litre of nitrogen separated from air was 1.2571 gm. The weight of a litre of nitrogen chemically prepared from ammonium nitrite, urea, or nitric oxide was only 1.2507 gm, a difference of 0.0064 gm. or 1/230. His experiments were too carefully performed and the results too constant for this difference to be due to an error in manipulation and he publicly drew attention to the anomaly.

Sir William Ramsay, Professor of Chemistry at University College, London, decided to investigate the problem. He planned to absorb the oxygen of a volume of air and then remove the nitrogen by combination with magnesium, as he already had conceived the idea of the presence of an inert gas. His theory was correct and the experiment was a brilliant success. a quantity of the gas being prepared and its properties studied.

Lord Rayleigh by this time had found Cavendish's note and collaborated with Ramsay in carrying out Cavendish's experiment on a modern scale. A considerable amount of the inert gas was prepared and found to be similar to Ramsay's. This discovery of a new gas in the atmosphere was first published at the British Association meeting at Oxford in August 1894 but it was not until January at a meeting of the Royal Society that a complete account of the discovery was given. It caused no little sensation among scientists.

Ramsay continued work upon Argon as the gas was named, and thoroughly investigated all its properties. Its principal characteristics were its inert nature and its monatomic composition. It was found to be present in the atmosphere to the extent of one per cent.

Ramsay then sought for other sources of argon. His attention was drawn to the work of Hillebrand of the United States Geological Survey who in 1889 had found that an inert gas was given off from the uraninite mineral cleveite, on boiling with sulphuric acid. Hillebrand thought this gas to be nitrogen; 12% of it certainly was. Ramsay repeated the experiment, and examined the gas in a spectrum tube; expecting to see the argon spectrum. However, he was struck with the brilliance of a yellow line close to the sodium D_1 and D_2 lines, which he could not account for and Sir William Crookes was asked to carry out exact measurements of the wave length of this line. This determination showed that it was none other than the D_3 line, only previously observed in the chromosphere of the sun during a solar eclipse in India in 1868 by Janssen, and afterwards shown by Frankland and Lockyer to be due to a new element in the sun which they named Helium from the Greek " Helios."

This discovery again aroused much attention and the great subject of discussion and speculation was the nature of these new gases and their position in the Periodic Table of the elements. Both were inert and monatomic. Their atomic weights were approximately 40 and 4.

Ramsay proposed to place them in a group by themselves, forming Group O. in the Table, before the family of alkali and alkaline earth metals. He also pointed out the probable existence of three more inert elements which would complete the family, a prophecy wonderfully fulfilled in 1898 when he and Dr. Travers obtained Krypton, Neon and Xenon from the least volatile portions of liquid air.

This question of the relation of these inert rare gases to the other elements, appositely enough, was the subject of Ramsay's presidential address to the Chemical Section of the British Association meeting in Toronto in September, 1897.

Occurrences.

During the next decade much work was carried out on helium. It was found to be present in small amounts in gases from mineral springs, occluded in many minerals, and even to the extent of four parts in a million present in the atmosphere itself.

In 1903 Cady and MacFarlane investigating a non-combustible natural gas at Dexter in Kansas found 1.84% helium present. This led them to an examination of other natural gases in most of which helium was found up to 1%.

Altogether, helium was found to be widely distributed but always in such traces, that it was regarded as a rare element.

Properties.

In spite of the difficulties of manipulation with small amounts of gas, the properties and physical constants of helium have been most thoroughly investigated. Apart from its inertness helium does not differ markedly from the other permanent gases. It is colorless, tasteless and odourless, little soluble in water or other liquids. The fact of its relatively high thermal conductivity is applied in the 'Katharometer' method of analysis. Its viscosity, refractivity and specific heats are accurately known. It obeys Boyles Law closely and approaches nearly to a perfect gas; on this account it is of especial value in gas thermometry. Many observers have investigated its spectrum, which is noteworthy for the brilliance and regular spacing of the lines and their work has been the basis of many theories of atomic structure. Another property that marks helium for distinction among the gaseous elements is the low boiling point—268.8°C. or 4.5° absolute. Its freezing point has not yet been definitely determined but is below —272°. Its critical temperature is 5.25° absolute and critical pressure 2.26 atmospheres. After ineffectual attempts to liquify helium had been made by several experimenters, Kammerlingh Onnes brilliantly succeeded at Leiden in 1908. The description of his work in the Proceedings of the Academy

*Lecture delivered by R. T. Elworthy, Research Chemist, Mines Branch, Ottawa, before Ottawa Section, Society Chemical Industry, December 9, 1920.

of Sciences, Amsterdam, is invaluable to workers in the field of cryogenic research, on account of its wealth of experimental details.

But the chief property that has given helium such a unique place among the elements and made it a subject of so much investigation by scientists was the discovery by Ramsay and Soddy in 1903, that helium was a product of the disintegration of radium. Further investigation by Sir Ernest Rutherford showed that the α particles given off from any radioactive substance were essentially helium atoms each carrying two unit positive charges of electricity.

Helium as a Balloon Gas.

The destruction of innumerable observation balloons in France during the early days of the war and the spectacular conflagration of a Zeppelin over London in 1916 emphasized the inherent weakness of hydrogen as a balloon gas.

Helium, which would be incombustible and non-inflammable and which would only have 8% less lifting power than hydrogen, at once seems the ideal gas for this purpose. It was referred to as such in a German book—"Die Angewandte Chemie in der Luftfahrt"—published early in 1914. but the author sadly remarks that its use is a "utopian dream" because of the small quantity in existence.

Fortunately the British Empire possessed a man with sufficient imagination and faith to suggest its possible production and utilization.

The great advantage of its non-inflammability and non-explosibility can be applied in several ways. The engines can be placed within the envelope, a modification which would be an important factor in the design of the airships of the future.

The buoyancy of the envelope may be increased or decreased at will by expanding the gas with heating devices or by contracting by cooling. This would materially change the technique of airship navigation.

A third advantage is that the diffusion of helium through balloon fabrics is 30% less than that of hydrogen and therefore the loss to be made up at intervals is less than with hydrogen.

Experiments, both in the United States and at the University of Toronto have shown that up to 15% hydrogen can be added to helium without the mixture becoming inflammable and therefore a gas composed of 85% helium and 15% hydrogen would be employed.

In view of these statements it is interesting to enquire what likelihood there is of helium being used for peace time service. The days of the commercial air ships will surely soon come. The United States Government has recently voted $25,000,000 for their development and R38, building in England will soon be delivered to the United States Navy. France and Germany have also schemes projected. It is said a large German-American company is only waiting for some of the restrictions of the Peace Treaty to be lifted to put in operation a service of air ships between San Francisco and Berlin.

Yet perhaps for commercial purposes helium is not so important as for war. Air Commodore Maitland speaking at a recent Air Conference in London said. "Any risk of fire from the use of hydrogen was entirely a war risk. If helium were available the war uses of airships would be greatly extended. It was not necessary however for commercial service and the use of gasoline was really a greater danger than hydrogen."[1]

British Production of Helium.

Sir Richard Threlfall seems to be the first in England to consider the use of helium seriously and he convinced the Board of Invention and Research of the Admiralty that it was worth investigating sources of supply and possible extraction processes. This work was entrusted to Professor J. C. McLennan of Toronto University in the autumn of 1915 and he with the help of the Staff of the Physics Department examined samples of natural gas from most Canadian fields and later from all parts of the Empire. An account of that work was recently published in Bulletin 31 of the Mines Branch, Ottawa. It showed that a number of Canadian natural gases, notably those from the Bow Island field near Calgary, Alberta, and from some fields in Ontario contained from 0.1 to 0.3% helium.

Hamilton.

In 1917 a method of extraction was devised and an experimental plant was established at Hamilton, Ontario. Tests with this plant showed that a gas containing 5% helium could be obtained from the raw gas—0.33% helium—by passing it once through the apparatus. With further experiment and development of apparatus, a gas of 87% purity was obtained.

Plant at Calgary.

It was soon realized that the Hamilton gas supply was not suitable for commercial development. The volume of gas available was too small and higher hydrocarbons, propane, butane, hexane, etc. were present which caused difficulties. Therefore a larger plant was designed and erected at Calgary, Alberta, to operate on the Bow Island gas in which is available 20,000—50,000 cubic feet helium per day. This plant started operations in Dec. 1919, and was in operation till April, 1920. Altogether 26 runs were made, resulting in the production of several thousand cubic feet of 90% helium. Modifications were made in the plant until finally 500,000 cu. ft. of raw gas, 700 cu. ft. of 87.90% helium was obtained, showing an efficiency of about 67%. The addition of another purifier makes it possible to treat the 90% gas and obtain practically pure helium.

Work in England.

Meanwhile Professor McLennan's staff in England was working on the many accessory problems, among which were the analysis of natural gases from various sources in England, Italy and New Zealand; the permeability of balloon fabrics to helium; various methods for the determination of helium in mixtures of gases, using a density balance, the Jamin interferometer, a charcoal absorption apparatus and the Shakespeare Katharometer, an ingenious electrical instrument depending on the conduction of heat from a platinum wire which formed one arm of a Wheatstone bridge arrangement. Other subjects of research were the composition of the vapour and liquid phases of the system methane-nitrogen, a continuous flow charcoal absorption method of purification, and a study of the helium spectrum.

A liquifaction apparatus was also in course of construction but was not completed when the laboratory was disbanded.

The History of United States Helium Production.

It was not until June 1st., 1917, that R. B. Moore and G. Burrell brought the question of helium extraction from natural gas to Colonel Chandler of the Army Balloon Service, though Moore had heard in 1915 of the British Government's activities in a letter from Sir William Ramsay, and the Bureau of Mines knew of the Canadian investigation. The question was referred to the Navy authorities who became quite enthusiastic. Dr. Cottrell was called into consultation and on July 31st., 1917, $100,000 was allotted for the work of extraction.

About this time a commission from the British Admiralty arrived in America and as a result of further conferences the importance of the problem was realized and a further allotment of $500,000 was made.

The two chief air liquefaction companies in the States were approached—The Linde Air Products and the Air Reduction Company—and they each agreed to design and erect plants at Fort Worth in Texas for an estimated daily production of 7,000 cu. ft. helium using a gas containing 0.9% helium. Great efforts were made to get the plants built and in operation quickly. The Linde Plant which cost $300,000 commenced to produce gas on Nov. 6. By April 21st, a purity of 50% was attained.

[1] "Engineering," Oct. 22, 1920, p. 529. British Production of Helium.

By September a daily production of 5,000 cu. ft. 70% helium was obtained. This was purified by a second process 92-93%.

The Air Reduction plant, based on the Claude process only cost half as much but it never attained as great a success as the Linde plant though helium was produced in quantity. At the same time the Bureau of Mines developed the Jeffries Norton system, based on more efficient thermodynamic principles. This plant was located at Petrolia, Texas, where the Fort Worth gas wells were drilled, but it was not completed until October 1918. It has a rated capacity of several times either of the other two plants but it required much adjustment owing to the novel character of many of its parts. It is proving a successful and economic process, however.

At the time of the armistice 147,000 cu. ft. of 93% helium was about to be shipped, at New Orleans, in cylinders at 2000 pounds pressure each holding 200 cu. ft. measured at N.T.P.

In conjunction with the work of production, the United States Geological Survey carried out a survey which showed that enough natural gas can be treated to supply over 250,000,000 cu. ft. helium during the next three years. and the Bureau of Standards made many accessory investigations called for by the extraction processes.

This outlines in a very brief manner the production of helium on a commercial scale in the United States. Tribute must be paid to the ability and agressiveness of the scientists and engineers who were responsible for this successful phase of war-effort.

The Extraction of Helium from Natural Gas.

The following analysis are of natural gases from which helium is extracted:

	Bow Island Field, Canada.	Petrolia, U.S.A.
Helium	0.33	0.9
Methane	87.6	52.7
Ethane	0.9	9.3
Nitrogen	11.2	36.9
Carbon dioxide	trace	0.2
Water vapor	trace	—

The obvious method to apply for the isolation of helium from such gases in view of the low boiling point of helium is a liquefaction method, methane liquefying at —164° C. and nitrogen at —196°C and the treatment will be analogous to the liquefaction of air and separation of oxygen and nitrogen. The plant will comprise a series of purifiers, compressors heat exchangers, liquefiers, vaporizers and rectifying columns; and the chief problem lies in securing an efficient heat balance among the liquefiers and vaporizers.

Each method of air separation—the Linde and the Claude—was applied for helium production in the United States. Both of these processes have only about a 10% efficiency, though they produced helium. The Jeffreys Norton system[2] based on better thermodynamic principles was developed by the United States Bureau of Mines and a large plant has been built. No description of the practical design and details of any of these helium plants has yet been published.

The Canadian plant at Calgary was based on the Claude method.

The process in brief is as follows. Gas from the main is passed through purifiers consisting of caustic soda solution to remove carbon dioxide, and calcium chloride to remove water vapour and then compressed to 30-40 atmospheres pressure. The compressed gas is led through heat exchangers composed of concentric coils of copper tubing, thence through the liquefier and Claude expansion engine to the bottom of the liquefying and rectification column, where some methane is liquefied and uncondensed methane, nitrogen and helium pass on through coils in a series of chambers, composing the column.

These chambers contain liquid of progressively higher nitrogen content and a lower temperature. More and more of the gas is liquified and run in to replenish the liquid in the various chambers and the uncondensed gas becomes relatively richer in helium. It finally issues having a composition of about 94% nitrogen and 6% helium. This gas is then again compressed and passed through further exchangers and through two more condensing chambers cooled by liquids and vapors from the column, until at a lower temperature the greater part of the nitrogen is liquefied leaving an uncondensed gas of 87-90% purity.

A further auxilliary purifier to obtain 99% gas was also developed in which the 90% gas is compressed to 100 atmospheres pressure and subjected to a temperature of —200° C. obtained by evaporation of liquid nitrogen.

A complete account of this plant was given in a lecture by Professor McLennen before the Chemical Society of London last June[3].

This treatment of the natural gas in no way interferes with its ordinary commercial use, as it is passed back into the gas mains unchanged in composition and heating value, save for the removal of the small amount of helium initially present.

[2] "The Separation of Air Into Oxygen and Nitrogen," F. E. Norton, "Chem. and Met. Eng.," Vol. 23, No. 11, Sept. 15, 1920, pp. 511-518.

Cost of Production.

Before the war the only method of preparation of helium was by heating minerals; the cost worked out to about $1500 per cu. ft.

The recent processes show it can be obtained for very much less. Professor McLennen estimates that a plant to extract the whole of the Calgary supply of helium, about 10,500,000 cu. ft. per year, would cost about $750,000 and the helium produced for less than $50 per 1,000 cu. ft. The estimated cost of the American helium by the older processes is about 10c. per cu. ft. and by the Norton process considerably less.

Hydrogen costs about from $5 to $10 per thousand cubic feet to prepare by field processes and from $1 to $2 per thousand by the common manufacturing processes on a large scale.

References.

Bibliography—U.S. Bureau of Standards, Circular 81.

Canadian Sources—Mines Branch, Bull. 31, 1920.

Production—*Jour. Chem. Soc.* Trans., Vol. 117, July, 1920, pp. 923-947; U. S. Bureau of Mines, Bull. 178 C, 1919; *Jour. Soc. Chem. Ind.*, May 31, 1919, pp. 121-126.

[3] Jour. Am. Chem. Soc., Vol. 117, July, 1920, pp. 923-947.

AMERICAN DYE PRODUCTION.

In 1914, according to a report prepared by Dr. Thomas H. Norton, there were seven American dye factories, employing 528 persons, their total production amounting to 6,619,729 lbs. of coal tar colours, valued at $2,470,096; in 1918 there were some 187 firms engaged in chemical manufacture, out of which 78 devoted their energies solely to the manufacture of dyes, turning out 58,464,446 lbs., having a value of $62,026,390. American dye manufacturing companies were recently consolidated in a merger to be known as the Allied Chemical and Dye Corporation.

GOVERNMENT ENCOURAGES COPPER MINING.

The Canadian Government following representations made by the Mining Institute of Canada and the Flin Fon Syndicate, has suspended for another period of ten years the royalty on copper ore. Commissioner Wallace of Northern Manitoba states that this action on the part of the Government was of extreme importance as it would allow of the proper development of the great Flin Fon district situated in the northern part of Manitoba.

New Name of Merger.

The great English chemical merger formerly known as Explosives Trades, Limited, which recently acquired an important interest in General Motors, Limited, will in future be styled "Nobel Industries, Limited."

Advances in the Practice of Lubrication

Experimental Work Connected with the Introduction of Fatty Acids in Place of Fatty Oils---Results of Trials on all Types of Machinery

By HENRY M. WELLS and JAMES E. SOUTHCOMBE*

THE considerations which we wish to bring forward in this paper are the results of many years' experience of the problems of lubricating oil and lubrication, studied from a physical and physico-chemical standpoint, assisted by an intimate and daily contact with the lubrication of all types of machinery and prime movers. Our primary object was to elucidate the reason for the obviously superior lubricating efficiency of fatty glycerides over "straight" mineral oils in a large number of practical cases which had come to our notice.

As a corollary to this we had to review the physical principles upon which lubrication depends and to seek an explanation of the peculiar property which has been called "oiliness," "body," etc., by authorities in the past.

It may not be out of place here to review the position of our knowledge of lubricants and lubrication.

Professor C. V. Boys, in his Presidential address to the Physical Society in 1903, crystallized the position very happily in these words:—

"It was found that the lubricating property of oil depended on something which at present is unknown—It is not viscosity—animal and vegetable oils lubricate better, i.e., they are more 'slippery' than mineral oils of the same viscosity, and though the oil trade has known how to make good 'slippery' mixtures, no one at present knows what 'oiliness' is, and this is at the present time an important physical quest of the engineer."

Again, Professor J. S. Brame has said that[1] "the property of 'oiliness' was one of the most puzzling of the properties of oils. By some it was regarded as unnecessary to connect it with viscosity directly, since it was possessed in a much greater degree by some fixed oils than by many mineral oils which had practically the same viscosity."

It is necessary to distinguish clearly between two distinct classes of lubricating practice. On the one hand we have the lubrication of fast-moving shafts, etc. supplied with a large excess of oil frequently under pressure, and in this case the frictional values are dependent primarily upon the viscosity of the oil; the mathematical and experimental investigation of these cases have been amply treated by Reynolds, Tower, Lasche, and others. On the other hand we have to deal with slow speeds at high bearing-pressures, frequently with a very limited supply of oil, and it is in these cases that the special property of "oiliness" or "body" is requisite to maintain the film, and it is here that viscosity measurements no longer assist us in the choice of the lubricant.

This view received unanimous support at the recent discussion on lubrication at the Physical Society.

Physical Properties of Liquids that Influence Their Lubricant Character.

What are the possible physical properties of a liquid which influence its character as a lubricant? They are viscosity, density, capillarity or surface tension, compressibility, and tensile strength. It is true that very little work has been done on compressibility and tensile strength, but from the observations of Worthington and others it would appear doubtful whether they would play a *distinguishing* role in the differentation of oils; and, further, as we shall point out, there is what appears to us an adequate explanation of the nature of oiliness without calling upon these properties.

So far as density is concerned there exists a wide range of petroleum mineral oils possessing specific gravities identical with those of the fatty or fixed oils, hence it is clear that density plays no determining part. Viscosity is, of course, of great significance in the cases of high speed etc just referred to.

Now it remained for Ubbelohde to point out that only a liquid which "wets" or "spreads over" the solid can constitute a true lubricant, because in order for the liquid to force itself into the narrower spaces of higher pressure it is essential on capillary grounds that the said liquid shall "wet" the solid surfaces.

Consider the case of two eccentric glass surfaces which are being forced together with a drop of mercury or oil between them. Now since the mercury does not "wet" or spread over the glass, the meniscus in this case will be convex to the liquid, while in the case of the oil which wets the surfaces, the meniscus will be concave. In the case of mercury the tendency on capillary grounds will be for the liquid to gather itself up into a drop and to pull the liquid film in the direction away from the narrower constricted area of greater pressure. In the case of oil the opposite will be the case.

This is exactly what is required in a lubricant, namely, that it shall penetrate into the narrow spaces between journal and bearing, and from the above considerations one clearly sees that liquids which do *not* "wet" solid surfaces cannot be described as lubricants.

Only those liquids which "wet" a solid surface possess lubricating power in the generally accepted sense.

Although these considerations appeared to indicate the connection between lubrication and capillarity, it will be seen that they only go so far as to enable us to say that mercury is not a lubricant and that oil is a lubricant. This is a conclusion of considerable theoretical interest, but it is not very helpful to the oil technologist who desires to differentiate between different classes of oils.

Accordingly we find that these speculations of Ubbelohde led to no practical result.

On the other hand, certain theoretical considerations had led to the conclusion that the permanence of liquid films depended upon capillary relationships, and in particular that *pure liquids would not show stable films.* These principles had not been applied, however, to the problem of lubrication, and, in fact, they were directly contradicted by prevailing practice in which there was a constant tendency towards greater purity, i.e., in the direction of refining the mineral oils which were used, and in the direction of using acid-free oil as a compounding ingredient.

The generally accepted view was therefore that capillarity was not a deciding factor in connection with the phenomenon of "oiliness," and various standard works contain statements to this effect.

It was under these conditions that we began our experiments. We were at once met by the fact that it was not possible to measure the surface tension between oil and the solid metal bearing, and it is probably on this account that Ubbelohde's speculations remained abortive. The usual "surface tension" is that of oil against air, and we confirmed the results of previous investigators, viz., that the results so obtained, for instance, by observing the rise in a capillary tube, shed no light at all on the question under consideration.

At this point we decided to measure the surface tension of the oil against an immiscible liquid in the hope that this might furnish some criterion of "oiliness." On proceeding to measure this interfacial tension, i.e., the surface tension between oil and water, startling results were at once obtained. The method of

*Abstracted from Journal Society of Chemical Industry, March 15, 1920, 51T-60T.

1 J. Inst. Pet. Tech., 1918, 4, 219.

experiment was by the drop pipette as follows:—The pipette consists of a U-shaped capillary tube provided with a bulb and a ground glass orifice. The bulb is filled with oil to the mark. By means of the capillary a very slow flow of oil may be obtained by opening the stop-cock. The orifice is immersed in a beaker of water, and the number of drops formed by a given volume of oil is counted. The surface tension oil-water is inversely proportional to the number of drops.[2]

A series of mineral oils were tested with this instrument, and then a series of animal and vegetable oils and compounded oils.

The following table shows a few results selected from a very large number of trials:—

Table of Interfacial Tension by Drop Numbers of Various Oils Against Water.

Mean Temperature 70° F.

OIL.	No. of Drops at constant orifice and head.	Tension in arbitrary units.	
Paraffinum liquidum	95	100	Mineral oils.
0.905 mineral	101	94	
Solar red mineral	102	95	
Non-viscous neutral	99	93	
Olive	132	72	Fatty oils.
Rape	138	68	
Coconut	161	59	
Lard oil	128	73	

A glance at the table shows the surprising fact that *the interfacial tension against water of the vegetable and animal oils is much lower than in the case of a mineral oil.*

What is more, we were struck by the fact that we had here a test which showed a distinct physical difference between mineral and saponifiable oils independent of viscosity, density, etc., and this difference appeared to be in conformity with the lubricating properties of the oils.

It now remained to enquire what was the reason for the difference in tension. After considerable experimentation we proved that the lowering of the interfacial tension against water in the case of fatty oils was *due to their slight content of free fatty acidity.*

The following table shows some of the results:—

OIL.	Free fatty acids, calc. as oleic.	Drop no.	Interfacial tension.
0.905 mineral	nil	101	100
98 % mineral, 2% com. fatty acids	1.9	125	80
97% mineral, 3% com. fatty acids.	2.8	130	78
Olive	2.2	125	80
Olive	4.5	140	72
Rape	2.5	132	76
Coconut	4.1	148	68
Olive (neutral)	0.1	110	92
Rape (neutral)	0.15	108	93

By removing the free fatty acids from the saponifiable oils the tension rises, and by adding free fatty acids to the mineral oil the tension can be lowered.

Now, all commercial animal and vegetable oils contain small quantities of free fatty acids, and even if the utmost care has been taken in refining to remove the acidity, hydrolysis soon sets in and free acids are formed which, in even relatively minute quantity, suffice to lower the surface tension.

The following table shows the percentage of free fatty acids in representative samples of animal, vegetable, and compounded oils on the market:—

	Acidity (as oleic)
Animal oil, pale	4.2 to 25.55
Animal oil, brown	12.02 to 30.32
Castor, firsts	0.49 to 1.70
Castor, seconds	2.12 to 7.40
Coconut, Cochin	1.26 to 19.11
Colza, Belgian	1.97 to 3.22
Colza, Stettin	1.41 to 4.48
Lard, pressed	0.28 to 0.71
Olive oil, Algerian	2.52 to 13.72
Olive oil, Gallipoli	12 to 33.14
Palm oil	24.68 to 56.05
Palm oil bleached	14.1 to 27.49
Rape oil, Black Sea, refined	1.82 to 4.34
Rape oil, East India	1.26 to 4.24
Sperm oil, Arctic no. 1	0.56
Sperm oil, Arctic no. 2	0.42 to 4.34
Sperm oil, Southern	0.7 to 2.86
Tallow	1.55 to 43.71

[2]Donnan, Zeit., f. Physik. Chem. vol. 31, etc.

Standard Brands of Compound Oils on the Market:

	Acidity (as oleic).
Marine engine oil, D	1.3%
Marine engine oil, O	5.15%
Marine engine oil, T	4.5%
Motor oil, X	0.26%
Motor oil, Y	0.5%
Motor oil, Z	2.5%
Compound steam cylinder	0.4%
Medium gas and oil engine oil	0.25%
Medium gas and oil engine oil	0.39%
Light gas and oil engine oil	1.6%
Light gas and oil engine oil	1.3%
Heavy gas engine oil	1.28%
Heavy gas engine oil	2.5%
Oil engine oil	0.7%

The above table is representative of the general glycerides and commercial compounded lubricating oils in daily use on all types of power plant, and we see that fatty acids are always present to a certain extent. From the foregoing it is demonstratable that:—

1. Capillary effects (hitherto ignored in lubrication) play a fundamental part.

2. The presence of fatty acids in an oil lowers the surface tension of said oil against water.

3. A neutral glyceride possesses a similar tension to a neutral mineral oil.

4. The addition of a relatively minute amount of a fatty acid to a neutral mineral oil reduces the tension to that of a commercial animal or vegetable oil or compounded lubricating oil.

Lubrication of Solid Surfaces.

Now it remains to enquire how far these results influence the theory and practice of lubrication of solid surfaces. It might be argued that the interface between oil and water is a different thing from the interface between oil and metal, and that the conclusions drawn from the one case are not necessarily applicable to the other. As a matter of fact such similarity in effect is not unknown in other instances, and to obtain more conclusive evidence Professor Lewis has measured the interfacial tension between oil and a liquid metal—mercury. (It should not be forgotten that solid-liquid interfacial tension cannot be measured. His results are as follows:—Pure mineral oil, 100; same mineral oil plus 2% of commercial fatty acid, 89. It is seen that again there is a lowering in the interfacial tension as a result of the addition of the organic acids, and, what is more striking, the relative lowering produced is very much the same as it is in the case of an oil-water interface.

Professor Lewis remarks:—"One may conclude therefore with some confidence that the addition of the organic acids will lower the tension at any metal-oil interface."

Again, as already pointed out, the permanency of films is dependent upon a diminished interfacial tension between the oil and the metal in contact therewith. If such a film is broken the possibility of its uniting again to form an unbroken layer depends entirely upon the interfacial tension being low. Any substance which lowers the interfacial tension causes the liquid to spread over a larger area of the solid. It follows therefore that if a substance be added to an oil which brings about a lowering of interfacial tension, such addition will act favourably as far as lubrication is concerned by preventing a rupture of the liquid film and preventing in turn the metals coming into direct contact.

The capacity for spreading may be considered as partly physical and partly chemical, due presumably to residual valency. The effect is to render the transition layer between the liquid and solid less abrupt. This diminution in abruptness can be brought about by chemical action direct or indirect across the transition layer or by the solubility of some third substance in both phases.

H. S. Allen has recently pointed out that on Langmuir's view oiliness depends on the chemical forces called into play between the active part of the oil molecule and the solid surfaces of the bearing.

Now it is obvious that there is a tendency for chemical activity

between the metallic surfaces of bearing and journal and an oil containing free fatty acidity, while such tendencies are less pronounced in the case of a neutral mineral oil. Such a tendency would render the transition between oil and solid surfaces less abrupt, would manifest itself by reduced interfacial tension, and would result in better spreading and consequent increased efficiency in lubrication.

There is little doubt in our minds that the physical rationale of the property of "oiliness" is now explained, and we have confined ourselves so far to a statement of the physico-chemical experiments which we have made and to the development of the physical theory.

Conclusive as it appears to us we have proceeded to test and verify the conclusions by direct friction measurements, and finally by the only real touchstone, namely, the test of experience in a long series of practical trials on all types of machinery and prime movers of the very largest sizes.

Results Obtained From Friction Measurements and From Trials On All Types of Machinery.

Results, which show that 1% of free fatty acids of rape oil added to a mineral oil are as effective in reducing the value of the frictional co-efficient as is the addition to the mineral oil of 60% of neutral rape, are striking confirmation of the above described principles, and coming from a totally independent and unbiassed experimenter afford great support to our contention that it is not the glyceride but free fatty acids in a compounded oil which improves its lubricating value.

Through the courtesy of one of the largest engineering firms in the country we have been enabled to make a series of measurements in a large friction testing machine, the results of which we here reproduce:—The test journal of the machine—which is of the Thurston type—is 3.8 in. diameter, giving approximately one foot peripheral per revolution. The length of the journal is 6½ in., and in all our experiments the load was 200 lb. per sq. in. The machine is provided with a revolution counter and a drum upon which the reading of the arc is automatically traced. The driving motor was operated by a variable speed controller, and all care was taken to ensure steady and constant speeds. The journal and bearing were thoroughly cleaned before each test by washing with toluol, and finally rotated against velvet pads to remove all superficial dust and moisture. The experimental temperatures was kept between 60° and 64° F.

The values of the frictional coefficients calculated from the curves obtained directly from the machine are given in the table.

By way of illustrating our point, four oils were chosen of identical viscosity and density but differing in composition thus:—

These results afford great support to the views expressed above, and, coupled with our experience in practical lubrication, about to be mentioned, confirm our explanation of the property of oiliness and open out a new and invaluable field in the manufacture of lubricating oil.

We should here mention that this principle of making lubricating oils by adding to mineral oils small quantities of fatty acids or substances which lower the interfacial tension has been accepted by the Patent Offices in all countries.

We should add a word here with regard to the possibilities of corrosion.

Oil.	Viscosity at 60° F. Second Redwood.	Sp. gr., at 60° F.	Total acidity, calc. as oleic acid.	Mean temperature of expts.	Peripheral speed in feet per minute.	Quantity of oil used for test.	Arc.	Coefficient of friction.
A. Pure mineral.....	973	0.909	nil	62	11	5 c.c.	40	0.0084
B. 97% Pure mineral. 1% Pale cylinder* 2% Com. fatty acids	973	0.909	1.9%	62	11	5 c.c.	25	0.0052
C. 80% Mineral..... 20% Olive.....	980	0.908	0.3%	63	11	5 c.c.	40	0.0084
D. 40% Mineral..... 60% Olive.....	970	0.907	0.9%	64	11	5 c.c.	35	0.0073

*Added to keep the viscosity constant

As will be observed from the table, all compounded oils which have been and are in daily use for years contain notable amounts of free fatty acidity, yet one rarely hears of any active corrosion.

In our case we add only very minute amounts of fatty acids, and the quantity is strictly limited and controllable. But where fatty glycerides are employed the amount of acidity which can form is potentially very large because hydrolysis is constantly going on, giving rise to the production of free acids.

During recent years a great deal of attention has been devoted to the study of the colloidal characters of the fatty acids, and it has been shown that while the lower members of the fatty acid group possess relatively little colloidal character, the higher members are highly colloidal in character. Donnan and Potts have shown that there is a gradation in these properties as one ascends the scale, lauric acid occupying a sort of intermediate position. Also the lower members of the series possess strong acid characteristics, while the higher members are very weakly acid. Now the fatty acids which occur in commercial oils are never pure chemical individuals, but are mixtures in varying proportions of a considerable number of fatty acids. Coconut oil, for example, is characterized by containing appreciable percentages of the lower members of the series, while rape oil rarely contains anything but the higher members.

It is only to be expected, therefore, that the behaviour of these oils will differ in accordance with the fatty acid groups which predominate in them, and it is possible to reproduce the capillary properties of any particular animal or vegetable oil by adding suitably chosen fatty acids to mineral oil.

Consider the case of a steam engine using saturated steam, where there is a tendency for condensation of water to occur in the cylinder and valves. It follows in such a case that the presence of a substance in the oil which lowers the surface tension against water will in such circumstances assist in the formation of oil films by enabling the oil to spread more readily or by overcoming the tendency of the water to wash the oil film off.

There is a certain type of lubricating phenomena to be considered where the oil is brought into contact with water and it is desirable that the oil shall either separate itself rapidly from the water (de-emulsification) or, conversely, that it shall mix or emulsify with the water.

Now the phenomenon of emulsification is dependent upon the colloidal properties of the oil, while de-emulsification is brought about by a greater concentration of hydrogen ions. Consequently one would expect the oil containing the higher members of the fatty acid group to possess an emulsifying tendency, while one containing the lower members will possess a de-emulsifying tendency. This is a feature which we have tested by shaking oils and water at various temperatures for long periods of time, and to a great extent we have been able to substantiate this view as the result of experiments.

After the soundness of our theory was clearly demonstrated in the laboratory it remained for us to put it to the touch of actual practice to prove its real value in the world of engineering.

Not a single failure has occurred in practice of an oil or an oil "essence" made on the "germ process" as a reliable lubricating oil when used for the purpose for which it was supplied. The meaning of "oil essence" is explained later.

We use the expression "germ process" to describe the oil made by using one or more fatty or other acids with one or more mineral oils, because the world has been taught for generations to look upon acid as the deadliest enemy to good and safe lubrication. As the *germ* is the first principle of organic life, by analogy we call a suitable acid when dissolved in mineral oil the "germ", which gives to mineral oil its life and activity as a more perfect "instrument of lubrication."

We do not claim that a "germ process" oil is better for all conditions of lubrication, but for many purposes where lubrica-

tion depends upon the oil alone and not upon any mechanical means, such as pressure, to maintain a continuous film.

We have proved to our entire satisfaction that the addition of fatty oils to mineral oils for many purposes of lubrication is unnecessary and a waste of valuable material, and that for such purposes oils combining small percentages of suitable free fatty acid or acids with suitable mineral oils are at least equal to oils compounded on the old formulæ for those purposes. Therefore many of the formulæ and specifications for compound oils are obsolete. Where the expression "compounded oils" is used, it indicates such old formulæ oils. Also, "mineral *oil*" indicates in many cases one or more than one mineral lubricating oil. "Fatty oil" includes tallow and other "fats" used for lubrication.

Gas Engines.

It has always been considered that the addition of coconut oil to a mineral oil gave the best results. Refined rape oil or other fatty oil was also used in conjunction with coconut oil to the extent of about 5% of each; that is, about 10% of fatty oil, 90% mineral oil. Especially on large horizontal units such a compounded oil was deemed essential. For smaller units smaller proportions down to 5% total fatty oil to 95% mineral oil; though some small units apparently required heavily compounded oils.

So far as our business is concerned, "germ process" oils have entirely displaced such compounded oils for horizontal and vertical engines up to the largest units of both types.

Some gas engines run on "straight" mineral oil with good results, but roughly it can be claimed that ten units run on "germ process" oil to one on straight mineral.

Oil Engines.

Compounded oils, and for some types "straight" fatty oils such as olive oil, have been considered essential for oil engines. For several types it was thought necessary to use a compound of *one-third refined rape oil* to two-thirds mineral oil. That oil has been entirely superseded by an oil with a slightly higher percentage of fatty acid than the average "germ process" oil for oil engines, but not over the maximum considered safe in practice. For other oil engines, land and marine, for which compounded oils were thought necessary, their place has been taken by oils made from one or more fatty acids with mineral oils of suitable quality.

The quality of the mineral oil with which the acid is blended is a very important factor in lubrication. The germ process gives to a mineral oil of fair merit that property lacking for some purposes; while it increases the lubricating value of a "good" oil, making it still better for many purposes. In both cases they become more economical.

Steam Cylinder Lubrication.

It is almost universally considered that for "perfect" lubrication of steam cylinders with certain types of valve gear (as one example, "Corliss"), and for engines working under certain conditions—say with much condensation in the cylinder—a compounded oil is essential.

"Germ process" oil incorporated in very small proportion with the correct mineral cylinder oil gives equally good results on engines with Corliss valves up to over 3000 h.-p. working at 160—170 lb. per square inch pressure, superheated 480—500° F.; on horizontal engines with Corliss valves up to 750 h.-p. up to 160 lb. pressure without superheat. Various mineral cylinder oil bases to correct "germs" in different but small proportions give thoroughly good lubrication on vertical and horizontal engines of many types, sizes, and pressures.

Oils for Steam Turbines, Crank Cases of Vertical Steam, Gas, and Oil Engines.

The property most essential in oil for steam turbines, namely non-emulsification, is the one which largely governs successful crank-case lubrication in vertical engines. In such cases and in turbines water from condensed steam or from the cooling system falls into the crank case and gets "churned" as it is pumped round with the lubricating oil. For these conditions one has to know something about impurities in the water, as the water is the deciding factor. The "germ" must be carefully adapted to the water as well as to the oil, and the oil to the mechanism. Where one oil is used for cylinder and crank-case lubrication (say, of gas and oil engines) the "germs" can be balanced to give what for convenience can be described in a general way as a positive effect in the cylinder where extra capillarity is required, and a negative effect in the crank case where emulsifying is undesirable, and where the engine is steam, of the splash lubrication type, to give just enough emulsion and no more for its intended work in the cylinder, also in the crank case, where it must emulsify. The germs, for they are many, can be so adapted when one thoroughly apprehends their properties, to give perfect lubrication in all such cases.

Marine Steam Engine Bearings—Open Type.

For a good heavy marine engine oil it has always been considered necessary, and is so to-day, to use from 10 to 25% thickened or blown oil—as a rule, thickened rape oil. This gives great viscosity, also very good "lathering" properties to the oil.

The standard specification for marine bearing oil for one of our semi-Government departments is a compound of about 20% "of fatty oil," but the total fatty acid content must not exceed 1%. This has now been successfully replaced by "germ-process" marine-engine oil.

On February 5, 1918[3], we filed our patent for oils made on this new process, and immediately its "publication or communication" was prohibited by the Admiralty, who carried out trials over many months on about fifteen ships of the mercantile marine, including a fair proportion of liners. The result was quite satisfactory.

At this stage we decided to supply the fatty acids in a form, which we term "essence," mixed with mineral oil and which can be conveniently used on board ship; about 2½% is added to the mineral oil as required. The result justified all claims. The consumption of mineral oil was considerably reduced, hot bearings were cooled, and thrust blocks were kept cool by the addition to mineral oil of suitable "germs". The trials were a complete success.

We think it desirable to say that it may not be advisable for oil users in general to buy fatty acids, to mix them in their oil and imagine all advantages mentioned will accrue. Suitable acids must be chosen for the purpose.

Conclusions.

We have shown (1) that fatty compounded oils are unnecessary for many purposes of lubrication; (2) that fatty oils are not essential for such work; (3) that fatty acids can entirely and completely displace fatty oils for those purposes.

[3]Eng. Pat. 130,677; see this J., 1919, 674A.

LARGE AMOUNT OF CHEMICALS USED BY CANADIAN PULP AND PAPER INDUSTRY.

In a preliminary report on the pulp and paper industry in Canada during the year 1919 the Dominion Bureau of Statistics, Ottawa, states that in that year there were 99 plants in operation in Canada. Of these, 33 plants made paper only, 39 pulp only, and 27 pulp and paper. According to provinces the plants are located as follows: Quebec, 46; Ontario, 38; British Columbia, New Brunswick and Nova Scotia, 5 each. The total capital invested in the pulp and paper industry in Canada in 1919 was $264,581,300. The amount of sulphur used by the industry during the year was 78,993 tons valued at $2,311,050; bleaching powder, 18,511,532 pounds valued at $423,153; soda ash, 3,284,-915 pounds valued at $78,246; sulphate of soda, 52,227,925 pounds valued at $694,025.

History of Sulphuric Acid Production in Canada

First Plant at London, Ont., 1866---Advances in Methods of Concentration---Nichols Plant at Capelton---Chamber and Contact Plants

By J. BOWMAN and A. NIEGHORN

IN PRACTICALLY all treatises on Chemical Technology an allusion is made to a remark of somebody "that the condition of a Country's prosperity may be determined by the extent of its manufacture of Sulphuric Acid." If there is anything in this observation—and there really seems to be — then the birth of this manufacture in Canada is most important and might be counted as the beginning of an epoch in our Country's commercial growth. On looking back now it appears to have been to our manufacturing development what the trail-maker had been to the settlement of our country.

It is not always that we can confidently place our finger on the cause of the initiation of an industry. In this case, however, it can be specifically done.

Just prior to the American Civil War a movement was made to exploit the oil exposures in Pennsylvania which resulted in the sinking of wells and in the production of Petroleum Oil in quantity sufficient to constitute it a commercial article. Refining experiments were instituted which resulted in a permanent oil producing and refining industry being established.

In our own western peninsula of Ontario were good showings of oil called "gum beds" by the farmer inhabitants; who objected to them because of the injury their crops suffered when waterways in the district were under flood conditions. Wide-awake Canadians took note of the developments in Pennsylvania and shallow wells were drilled at oil springs in 1862. Refineries were soon started in Hamilton, Woodstock, London and Petrolea.

Now the chief chemical necessary to the process of oil refining is sulphuric acid. What was then deemed large quantities of it were imported from the United States. The most convenient market for our consumers was Cleveland and the most direct route was by lake to Port Stanley, thence by rail to the refining districts. As this acid all came over the London and Port Stanley Railway to London, it was but natural that the attention of our business men would be drawn to it. This resulted in the formation of a company in London known as the Canada Chemical Co., which erected the first Canadian works for the manufacture of sulphuric acid in about the year 1866.

London, Ontario, Works, 1866.

As we regard sulphuric acid works to-day this was but a small affair. Its plant consisted of two lead chambers, one sulphur burner of the Blair type and a concentrating system of lead pans with about twenty glass bottles called retorts, though they were not used for distilling but for concentrating only. The point of desired concentration was determined by the appearance of white fumes over the surface of the acid or by a clearing up of the contents after a pinch of sawdust had been added to it. Under this treatment the acid would first become black but when a specific gravity of 1.825 was reached it would become transparent.

This would strike a modern chemist as a very crude and inexact method but it was in accord with the usage of the time and fitted it well. In those days what is known as the "rule of thumb" was much in evidence in chemical technology.

The amount of acid produced was from 50 to 60 tons per month. The raw material used was Sulphur from·Sicily. When manufacturing first began the water necessary for the re-action was placed in the bottom of the chambers and the process had beeen under way for several months before the idea of supplying the water as injected steam was introduced. As might be expected this was followed by a wonderfully larger yield of acid. This emphasizes the crudity of the manufacture as well as anything I could say.

Not long after this some persons having obtained possession of pyrites mines near Capelton, Quebec, either built a small works or threatened to do so and thus obtained so much influence over the London works as to have its process changed from using Sulphur to Pyrites as a raw material. A few years after this change the London works were burned having been struck by lightning during a severe storm. They were at once rebuilt and then consisted of four lead chambers, with pan and retort systems as in the first works only on a larger scale. The Burners again reverted to the Sulphur type. This second works of the Canada Chemical Company were in turn burned down in 1887 and again rebuilt. This third works had three lead chambers each 120 x 20 x 18 feet and were not contained in buildings as were their predecessors.

Advances in Methods of Concentration.

Methods of concentration underwent a marked development. At first the system consisted of about fifty retorts each having an individual fire. Following this method was an overflow retort system which gave a continuous concentration. The retorts were arranged in benches of four or five set each higher than the next and having a stream of acid flowing from the highest to lowest. At the bottom was a cooler in which were an hydrometer and thermometer thus keeping constant check on the strength of the acid. This method had some good features but its benefits were forgotten when one of the retorts broke as it frequently did.

Facing a German army was a mild experience in comparison with that of a retort man in that emergency. It proved an extremely hazardous process on account of which it was abandoneed in favour of the former retort system.

In 1879 another very important advance was made in the method of concentration. A platinum basin of the Faure and Kessler type was installed and immediately effected a very great saving in fuel as well as providing a more uniform product It would be difficult for one, now knowing the acid manufacturing methods, to believe that it required a great deal of courage for a company to adopt such a radical and expensive plan. The arguments against it are probably forgotten. Some of us remember them well for we had a struggle to induce the London Company to adopt this adventure. It was said, as all chemists know, that lead was very destructive to platinum, that sulphate of lead from the chambers would settle in the platinum basin and would very quickly ruin it. That the platinum was so thin that the smallest indiscretion in the use of the poker would run it through the basin. That by such slight accidents, thousands of dollars worth of property would be lost and a stoppage of manufacturing for a long period would be the result. After operating this apparatus for a few years an addition of a second platinum basin was made which brought production up to about ten tons per day. This works continued to run till about 1901 when they were dismantled and removed.

Other Early Ontario Plants.

About the year 1870 an English syndicate purchased land at Petrolea and London, Ontario, sank oil wells and erected an oil refinery and sulphuric acid works at London. The company was called The Western of Canada Oil Lands Company and the acid works were known as the Ontario Chemical Works. The

*The subject of Sulphuric Acid production in Canada, as presented to the Toronto Section, Society of Chemical Industry, November 26, 1920, by Professor Bowman and Mr. A. Nieghorn.

latter consisted of two small chambers with glass retort concentration and produced from 35 to 40 tons per month. They were operated for 7 or 8 years when the company withdrew and the chemical works were taken over by the Canada Chemical Company. These works were dismantled in the year 1888.

Somewhere in the early seventies sulphuric acid works of some importance were erected near Brockville, Ontario. The company was called the Brockville Chemical Company.

If ever an enterprise suffered tragic misfortune this one did. A deposit of pyrites had been discovered about four miles from Brockville and at this point works were built. Three or four chambers were constructed and all was ready for manufacturing to begin when a cyclonic wind fell upon it levelling everything with the ground. With commendable energy the company rebuilt the works which for a few years were operated successfully. Then an even greater misfortune befel them for the pyrites deposit upon which the works were built and upon which it depended for its raw material, came to an abrupt end.

Pyrites now had to be imported from the United States, so that both the raw material as well as the finished products suffered the dreadful tax of wagon transportation over a road four miles long but of a desperately bad character. Not only did this render transportation charges exceedingly heavy but there was much loss from breakage as all shipments were in glass carboys.

Building of Nichols' Plant at Capelton, Quebec.

The last and crowning misfortune was the building of the Nichols Chemical Works at Capelton. This placed the Brockville works between two competitors neither of which had any such handicap. In about 1889, the company gave up the fight and the works were dismantled.

In the late seventies a single chamber was erected in Montreal using as raw material "Spent Oxide" a refuse of the Gas Company there. It did not concentrate, making chamber acid only, which it continued to do for some years but at last succumbed to the pressure of reduced prices occasioned by improved methods in the other existing works and by the establishment of the Nichols Chemical Company's works at Capelton.

In the year 1874 or 1875 recovery works were erected in London They had for their object the clarifying and reconcentrating of sulphuric acid that had been used in the petroleum refining process. They afterwards removed to Petrolea but at no time was their output of much importance.

In about 1886 or 1887 the Nichols Chemical Company built a large works at Capelton, Quebec. This was the greatest effort yet attempted in the sulphuric acid manufacture in this country and is to-day one of the leading Canadian works.

SULPHURIC ACID MANUFACTURING IN CANADA SINCE 1895.

In 1895 The Victoria Chemical Company of Victoria, B.C., established a chamber plant for the manufacture of sulphuric acid, concentrating to 66° Beaume, or a strength of 93.19% H_2SO_4. This plant is still in existence. In 1901 a small chamber plant was started at Sydney, N.S., by the Dominion Coal Company, now the Dominion Iron and Steel Co., but was dismantled and replaced by a larger one in 1911. The new chambers were known as the type of high chamber erected by Falding, being a single large chamber 70 ft. high and about 50 ft. square, with a circular Glover tower 10 ft. in diameter and 20 ft. high. The gases after leaving the chamber were passed through four towers 50 ft. high and about 10 ft. square, the first acting as a cooling tower, while the other three performed the functions of a Gay-Lussac tower. The output was about fifty tons of acid per day of the strength 50°, which is 62.18% H_2SO_4. A concentrating plant has since been added with capacity of about five tons per day of 66° Acid. This concentrating plant is of the cascade system and they required this extra strength to enable them to purify their benzol distillates.

The chamber system at Capelton, Quebec, of the Nichols Chemical Company, referred to by Professor Bowman, was replaced by the contact or catalytic system in 1906, while further contact plants were established at Sulphide, Ontario, in 1907, and at Barnet, B.C., in 1908 by the same company. All of these contact plants have been in operation since their erection, and are the only ones of this type in Canada at the present date.

About the year 1907 The Algoma Steel Corporation of Sault Ste. Marie installed a Falding high chamber plant, as they required the acid to sulphate the ammonia in the coke oven gas, and this plant is still in existence.

About the year 1909 a chamber plant was established at Hamilton by the Grassilli Chemical Company and this plant concentrates to 66°.

In 1914 The Consolidated Mining & Smelting Company of Trail, B.C., erected a small chamber plant to enable them to treat their zinc lead ores and manufacture acid hydrofluosilicic, necessary in the reduction of their lead ores, and this plant is still in operation.

During the war The Aetna Chemical Company erected a chamber plant at Drummondville, Quebec, but this plant has not been operated since the war and is, it is reported, to be dismantled.

The British Chemical Company built, during the war, a chamber plant at Trenton, Ontario, and ceased operating when the war was over. A new Company, Chemical Products, Limited, has, however, been formed to take over and operate this plant, and I believe will specialize in acidifying phosphate rock.

Thus we have five chamber plants operating in Canada, and two in position to operate, one of which I referred to as about to be dismantled, as against but three contact units.

This will naturally raise in your mind the question as to why they are not all chamber plants or all contact.

In the chamber plants a low acid content is the first result, and in some cases can be used at this strength, while in many other cases it must be concentrated to make it of use; yet concentrated acid is the first result in the contact process, and has to be diluted to bring to the best shipping point, or to 66° Beaume, for the reason that this is the greatest strength that our climatic conditions will allow uninterrupted shipping: this acid freezing at something like 30° below zero, while acid of greater concentration freezes at a higher temperature than will congeal water.

The explosives people naturally prefer sulphuric acid of almost its greatest concentration, and to permit of its shipment, nitric acid is added in quantity to prevent freezing.

In California the oil refiners use a great deal of this concentrated sulphuric acid or oleum as it is called, yet in this country, for the reason already given, it is not practical to equip their plants for the use of this fuming acid, as the oil refiners can not permit the addition of nitric acid, necessary to keep this acid from congealing.

The explosives people are large users of oleum in Canada, and it may be interesting to note that Canada exported in the four years ending 31st March, 1919, the terminating date of Canadian Government returns, over $995,000,000 in value of explosives, and to enable the Canadian manufacturers of explosives to do this business, they purchased from the Canadian sulphuric acid manufacturers, over 300,000 tons during the time mentioned.

Explosives are used very largely in railroad building, mining, etc., so that the business with which we associate the thought of war, is likewise a great factor in the progress of the nation in time of peace, so that the manufacture of sulphuric acid is really necessary to the welfare of the nation at all times.

Professor Bowman was right in referring to sulphuric acid as the trade barometer; its use being necessary in almost every

line of endeavor, and the volume consumed indicates very closely the industrial progress of the nation.

The premier use of the product that induced the erection of the first sulphuric acid plant in Canada was in oil refining, but since then the erection of factories in many lines in Candaa has provided a market for many other uses such as the manufacture of muriatic, nitric, phosphoric and acetic acids; in tanning, milk testing, glycerine and glue manufacturing; in the treating of cobalt, nickel, lead and zinc ores; in the tinning, galvanizing, plating and metal trades; paper making, electrolyte in storage batteries; sulphating alumina and ammonia and acidifying phosphate rock, etc.

THE INTERNATIONAL DYESTUFF SITUATION.

Events have been following fast in the International dyestuff situation. For some time the situation has been growing more acute in both England and the United States. The growing power of Germany to reclaim her lost markets has been a cuse of worry to both British and American dyestuff manufacturers. This lead to the seeking by these interests of suitable protection from their respective governments. Legislation has been pending and the British government has taken the initiative. A Dyestuffs Import Regulations Act was passed in England in December adopting the license system for importations. This will allow for the fuller gradual development of dyestuff industries in England. The details are to be worked out by the Board of Trade. A special committee will pass on all import licenses. This committee will consist of five users of dyestuffs, three manufacturers, and three neutral individuals. If England again lost her dyestuff industry, it would mean a gradual loss of her textile business, and at the same time would weaken her industrial chemical fabric in a way which can never be allowed again. In the United States over $100,000,000 had been invested in laboratories and plants connected with dyestuff manufacture, and the Longworth Bill has been before Congress for the last year. This is designed to protect American dyestuff manufacturers, and now that there is the possibility of shipment through England to the United States by interests of German origin, and the further outlook that Congress may make some kind of peace by resolution, throwing out all protection that came through regulations relating to trading with the enemy, the situation is grave.

All interests in the United States are not behind the dyestuff manufacturers as they should be. There is a lack of appreciation of the significance and importance of this question which now that it has been successfully overcome in England, will probably meet with better treatment in the United States. These small bills receive poor attention by Congress, and it is only with the greatest difficulty that a proper hearing is obtained. The relative smallness of cash interests and the multitude of other pressing matters has allowed these bills designed to protect basic American industries to proceed slowly. There is no doubt but that congress will respond favorably, if not in the first instance, at least before serious damage is done by German importation.

No one questions the necessity of establishing business connections with Germany. Trade must remain a matter of give and take, but when it comes to allowing key industries to be either destroyed or not created, the matter is of national importance, and it is quite outside the question of money involved. It is a hopeful sign that this has been appreciated in England, and is likely to come in the United States.

WASTAGE OF GASOLINE BY EVAPORATION

While engineers, chemists and automobile men have been bending their best efforts toward developing some liquid fuel as a substitute for gasoline to meet the ever increasing demands of the automotive industry, the United States Bureau of Mines comes forward with the declaration that the entirely preventive losses in the evaportaion of gasoline from crude petroleum from the time petroleum leaves the wells until it arrives at the refineries reaches a total of more than 300,000,000 gallons each year, or sufficient to keep 1,200,000 automobiles in commission for a year if each car uses 250 gallons of gasoline.

These, according to the Bureau of Mines, are merely the preventive losses from evaporation alone and do not take into consideration other losses, many of which in part may be avoided. The total loss from evaporation amounts to more than 600,000,000 gallons of gasoline for the country, according to the investigations of the bureau, which has calculated that one-half of this, or 300,000,000 gallons of gasoline, may be saved.

The worst feature to this is the fact that the gasoline wasted is the most volatile and consequently the best quality of gasoline obtainable. It follows that the prevention of this loss, which is economically possible, would not only increase the gasoline supply materially but would also increase the general standard of the gasoline.

The bureau will issue, shortly, careful directions to the oil men as to how this situation may be remedied. It is estimated by the bureau that the 600,000,000 gallons of gasoline lost through evaporation each year is worth as a national asset about $150,000,000.

J. O. Lewis, petroleum technologist of the bureau, in his statement on these losses, says:—

"From the time that the crude oil reaches the surface of the ground at the well, the oil passes through a series of tanks and pipe lines until it reaches the refinery, sometimes thousands of miles away. In the course of its journey the oil is exposed to sun and air, and the gasoline, being very volatile, vaporizes and escapes into the atmosphere. Although it has been generally known that such losses occur, no one, up to the present time has called attention to their magnitude. The methods of handling crude oil in the field have grown up from the time when gasoline was a drug on the market, and there was consequently no incentive for conserving it. Until recently no one stopped to consider whether the methods devised for conditions twenty and thirty years ago were still satisfactory for today."

PERSONALS

Prof. George Guess, Department of Metallurgy, University of Toronto, is chairman elect for 1921 for the Toronto Branch of the Canadian Institute of Mining and Metallurgy.

Mr. H. H. Claudet, who for some years has been in charge of the Ottawa Branch of the General Engineering Company, consulting engineers, has taken over the Ottawa office and laboratory and will carry on the business independently.

Mr. Arthur A. Lehmann, formerly of Katzenbach & Bullock, New York, is now affiliated with A. S.Wander & Sons, Chemical Co., Inc., Albany, N.Y. Mr. Lehmann will have full charge of this company's heavy chemicals, oils, dyewoods, acids, etc.

Dr. A. B. McCallum, formerly Chairman of the Honorary Advisory Council for Scientific and Industrial Research and now at McGill University, will leave shortly for China where he will spend the next few months delivering a series of advanced lectures to Medical Students in connection with the work of the Rockefeller Foundation.

Dr. Eugene Haanel, for many years connected with the Technical Service of the Dominion Government and Director of the Mines Branch since 1907, resigned on December 15th. He was formerly Superintendent of Mines in the Department of the Interior. His work is well known to Canadians and others interested in the development of mineral resources. Both his personal investigations and those of his staff have been quite varied, and in many instances, of important economic value. John McLeish, whose knowledge of the Mining Statistics of Canada is second to none, , is now Acting-Director of the Mines Branch.

International Co-operation in Science*

By DR. R. F. RUTTAN

A CALL for efficiency followed the declaration of war. A desire for co-operation has followed the declaration of peace.

Just as the doctrine of relentless efficiency played its important role during the mobilization for war, so to-day the gospel of voluntary co-operation has penetrated and influenced the political, industrial and scientific activities of all the allied nations. It has strengthened the bonds of esteem and friendship that existed during the war, and has cultivated a closer moral and intellectual union among the allied peoples.

The general recognition of the value of co-operation may be truthfully described as the best positive product of the great war. It has given birth to what may be called the international mind, the moving spring of which is the idea of a world-wide community of the human race and the desire for its realization. Internationalism is everywhere active. There is a growing tendency towards the consolidation of various human interests, a drawing together of humanity which tends towards mutual understanding and mutual happiness among the nations.

The highest ideal of the internationalist is the League of Nations, for it is an effort at world-wide political and national co-operation, "a unification of the whole human race into a single family, organized group or community." Among the less ambitious of the international movements is the International Research Council, which embodies the concept of international co-operation in science.

A very few years ago the scientific workers in the British Empire were generally content to work individually in the dissemination of the knowledge of nature and the control of energy. The great majority of scientific workers of all grades, from research students to professors and directors of research laboratories, also worked as individuals, as knights errant in the warfare against the unknown. This resulted in ill-balanced investigation, especially in chemistry, where we had duplication in many places and incomplete research in others.

Scientific discovery progressed in its slow conquest of the unknown. Men of science had the leisure to think, but were more or less detached from their colleagues in universities, from the industries and from public affairs, and occasionally one could detect a tone of superiority in their relations with the world of affairs. They even compared notes with men of science of other nations, once in two or three years, and then "rendered unto the Teutonic Cæsar the things that were Cæsar's, and some that were not." The chief indication of a desire for co-operation could be seen in the annual meetings of the British Association for the Advancement of Science. The great learned academies of the world continued to play their important part in the encouragement of scientific work. It is a matter of pride to us of the Royal Society of Canada to recognize the splendid work done by the great academies of Europe. To those of us who have taken an interest in the early history of these academies, the part they have played calls for our sincere admiration. The work of the Fellows and Members has always been characterized by an unselfish sincerity in their desire to advance science in all its fields of activity. The oldest of the academies, namely, the Academia del Cimento, in its early days published the investigations of its members anonymously in the name of the Academy. This, Dr. Levene in a recent address has characterized as "perhaps the most sublime example of self-obliteration in the service of an ideal ever known in the history of science."

England has had for over half a century a staff of officers of higher command in science, perhaps the finest in the world, men whose researches show the broadest generalizations, the greatest insight and imagination in scientific investigation. They had the opportunities and the leisure to work out the strategy and perfect plans of attack on problems of the highest importance. Unfortunately, however, this remarkably able staff was not provided with the rank and file of scientific workers—with brigades of scientifically trained chemists, engineers and physicists, capable of taking to the army, navy and industries of the country, the latest applications of science to problems of every day life. In all her industries, the proportion of university trained men to artisans in England was one to 500; in Germany, one to 40. Germany in the industries and associated with her military activities had an army of scientifically trained men, numerically far superior to those of England and France, but her scientific headquarters was not occupied by officers of such vision, training and scientific brilliancy as characterized the higher ranks of science in England and France.

It was not the want of scientific ability and knowledge that placed the Allies at a disadvantage in 1914, but the stagnant condition of applied science. The German policy resulted in the penetration of scientific methods and organization into every type of national activity.

The potential energy of the abstract sciences has long been recognized by a small minority of the people, but it required an upheaval such as we have experienced to demonstrate to every class in the community their value in action. The world at the close of the war was ringing with appreciation of what science had accomplished in the great struggle. It was perhaps a revelation even to those filling the posts of higher command in science, to find how capable of inventive achievement and initiative the ordinary laboratory man became when the incentive was great and when he acted under the stimulus of co-ordinated effort and personal contact with a master mind.

Not only was the science of each nation of the Allies mobilized and concentrated on military problems, but there was the closest confidence and accord among the scientific organizations of the several Allies. Communication by secret code kept the investigators in France, Italy, the United States and England in closest touch with one another regarding the vital problems they were studying in common.

Continuing the Co-operative Movement

The achievements in science, resulting from this international organization and co-operation during the war, were so outstanding that it seemed highly desirable to continue it in a modified form when the scientific efforts of the Allies would be directed to purposes other than military. Early in 1918 there was centered in Paris a group of those in charge of the international organization of science for the war. Men of greater eminence in their special fields and representing a greater diversity of expert knowledge had never been gathered at any international congress of science.

To develop and make permanent in times of peace the "liaison de convenance" hurriedly arranged during the war between science and its applications, is the complex problem now before the central national scientific organizations. They are studying the relations of the universities to national economic questions and the co-ordination of the scientific efforts of departments of the government having control of national resources. They are giving financial assistance to researches, both academic and technical, and encouraging able young graduates to enter the field of research by systems of fellowships, thus providing trained minds for fundamental and technical research. They are encouraging co-operation between allied sciences and arts, *e.g.*, Biology with Agriculture, Chemistry and Physics with Forestry, Psychology and Physiology with problems of industrial hygiene and industrial fatigue. By the formation of unions and guilds they are organizing co-operation among similar industries in research. Such activities as these illustrate what the national

*Abstracts from the Presidential address by Dr. Ruttan, Royal Society of Canada, 1920.

councils or similar central bodies are striving to accomplish "through the purely scientific process of organized effort."

The succesful development of organized science in each nation taking part in this international co-operative movement lies at the very foundation of the edifice which is designed by the International Research Council. This vast effort directed towards the conquest of practical life by science has behind it the efficient reserves of public opinion. The captains of industry have come to recognize the latent power of scientific research, and those engaged in the application of science have found that co-operation in researches secures concentration of effort, minimizes duplication and stimulates progress.

Permit me to pass for a moment from the general to the patricular, and to illustrate by a single example how effective co-operation has been developed by national organizations. One of the very successful methods of industrial co-operation is the formation of unions, guilds or associations among manufacturers engaged in the same industry, such as the cotton, iron or textile industry, with a view to improving that industry as a whole by technical research. Each union, by conferences, reaches a clearer idea of its scientific wants and is able to integrate the problems common to all for solution; each association has its special research laboratories, the findings of which are for the benefit of all engaged in that industry. The efforts to form these research unions by the Department of Science in England and the National Council for Research have been crowned with success beyond the highest expectations. The sub-department of industrial relations of the National Research Council of the United States is of very recent formation, but has already organized a number of powerful research unions. But it is in England,the home of individualism and trade secrecy, that this movement has made such astonishing advances. In January last, no fewer than 19 trades and specific industries had formed themselves into associations for the purpose of research work under the government plan, whereby a sum of nearly five million dollars is made available for industrial research of this type alone. These unions must be national in character and must obtain the approval of the research department of the government. After such approval each union receives financial support from the government equal to the amount expended by the association.

Industrial Secrecy Passing Away

The general acceptance of this principle of industrial unions in England would indicate that the policy of industrial secrecy, which has so greatly hampered the application of science to the industries, is now almost obsolete. Manufacturers are becoming alive to the truth of the statement that "the closed door to an industrial plant shuts out more than it shuts in."

This pooling of the expenses and proceeds of scientific research and organization may have a certain Teutonic flavor, but it has transformed isolated crafts to highly developed industries, eliminated needless duplication of effort, and prevented, at this critical period, incalculable loss through arrested development. In Canada, the Research Council has strongly advocated a similar type of co-operation, especially among the more distinctly Canadian industries, such as those related to the Fisheries and Forestry. While some progress has been made, we are really only touching the fringe of opportunity in this field of endeavor, but, as Dr. Coulter has pointed out, "we must remember that to bring into effective co-operation great numbers of isolated, scattered and sometimes conflicting units, takes time and a great controlling motive."

I have endeavored to show that co-operation and co-ordination are fundamental principles in so vast a project as a world wide union of science, where we are dealing with groups or regiments of specialists whose common efforts are to be adjusted and correlated by mutual agreement. Further, the direction, in an advisory capacity, of the economic forces of each separate nationality, by bringing about an alignment between production and the scientific principles underlying industries, is based upon co-operation. There are many plans involving the application of this doctrine, by which certain scientific activities of the universities may be linked up with each other and with those of government bureaus and industries to their mutual advantage and for the development of national wealth. Plainly stated, it has come to be generally recognized that co-operation and organization are the most efficient means of capitalizing science, of making it useful.

Permit me to sound a note of warning. There seems a danger of being carried away by the convincing examples of the success of co-operative science to such an extent as to lose sight of the significance of the individual in research, and to exaggerate the utilitarian motive in scientific investigation.

The advocacy of individualism in scientific investigation is regarded today, especially on this continent, as reactionary, but, as Prof. M.P. Armsby states, "It is just as true today as it ever was that the permanent and significant advances in science depend, in the last analysis, on the initiative and originality of individuals." Nothing can alter this fundamental fact, and again, "usually the best thing that can be done for a man of scientific vision, who is capable of the most fundamental kind of research, is to supply him with the necessary equipment and facilities and then let him alone. Committees and co-operators are in danger of being hindrances rather than helps."

While there is much truth in this statement, we must remember that many of the advances of the last century, with which are associated some of the greatest names in science, were in part co-operative. There was a directing mind of the master inspiring a group of scientific workers in association, who in turn stimulated and directed the master. The chemical work of Emil Fischer on the molecular structure of Protein, Purins and Sugars, that of Kekule on Benzene ring, of Sir Joseph Thompson on Atomic Structure, represent in each case the activities of a large body of research workers, whose investigations were co-ordinated by the master mind, but the workers were largely self-directed and the co-operation was a purely voluntary one.

Problems calling for the application of several branches of science, *e.g.*, Physics, Biology, Chemistry, etc., are especially adapted for co-operative effort, but this co-operation should be voluntary and democratic. Such mass attacks on problems are undertaken, for example, in the National Physical Laboratory, in the Bureau of Standards, in the Mellon Institute, and will form an important part of the activities of the new Canadian Research Institute. Co-operation of this kind has been found to develop rather than suppress individuality among the investigators.

The standard by which the world has come to measure the value of science is its capacity to aid in the production of wealth and power. The public recognition of science as a profitable investment is, to many the silver lining of the great war cloud. Among the recent articles in scientific journals, which are eloquent in the glorification of utility, we find a leader of manufacturers speak of science as "the handmaid of industry," and an astronomer quoting with approval "without the aid of science, the arts would be contemptible; without practical application, science would consist only of barren theories which men would have no motive to pursue." It is obviously true that a scientific discovery has its value enhanced when it admits of practical application, but this surely cannot be regarded as the sole criterion of its importance. The theory of evolution, the electron theory of atomic structure dealing with the infinitely small, or the Copernican theory of the heavens, to take an example from astronomy, cannot be classified as having utility in the ordinary acceptation of that word, nevertheless, these conceptions "have revolutionized our habits of thought and our outlook upon the world in which we live."

It may be generally stated that utilitarian motives, arising from war experiences and accentuated by the requirements of a period of reconstruction, largely dominate the scientific life of the world to-day. We must recognize, however, that researches along

these fundamental lines of sciences suffered during the war, particularly in the universities, from the withdrawal of support and from the transference of attention to more urgent needs. Professor Sumner asks, "To what extent is this shifting of emphasis irreversible? The investigator who continues along the newer paths will doubtless be following the lines of least resistance and he will have behind him all the force of public approval." The investigator may, to use the words of Dr. Raymond Pearl, come to "supplicate the great goddess, Truth, with one ear closely applied to the ground."

The scientific spirit which actuated research in the British Empire was largely idealistic until the recent great crisis of humanity forced it to give way to a purely material purpose. It was the times of peace and prosperity that supplied the leisure for intellectual pursuits and created the atmosphere for scientific growth from the bottom, for the accumulation of those scientific fundamentals that enabled us in the defence of the Empire to forestall and excel the enemy in the applications of science.

Now that we are entering upon a new era of peace, should we not endeavor to encourage at least a portion of scientific effort to seek other gods than those of immediate utility? Are we not beating the utilitarian drum too loudly in our university halls? The very life blood of the scientific departments in a university is the pursuit of science for the advancement of truth. Nevertheless we must not forget that the compelling events of recent years call most emphatically for its material application as well. The two objectives are not incompatible; they can be recognized in the same university with advantage to both, but one cannot help feeling there is a danger of the essential function being less developed than the subsidiary function. Should the universities not aim to develop the sciences in such a way as to bring about that very combination of æsthetic satisfaction and useful achievement which Poincaire has so well described?

The high privilege of the universities is the preservation of real knowledge, not only to see that such knowledge once acquired should not be lost, and to play the role of a vestal virgin in "guarding the torch kindled by others," but also to extend the boundaries of human knowledge. Research and the development of initiative in scientific investigation among students distinguish the university from the mere college, and capacity for research is the valuable product the country expects from its universities.

Just as the universities have duties to perform to the country, so have countries duties to perform to the civilized world. It is the duty of every country to participate in the discovery of the laws of nature, to enhance the powers of man and widen the range of his vision. The cultivation of the fields of pure science yields products which are of world-wide necessity and more lasting than the pyramids. Other human achievements wear out and disintegrate with time. The harvest of science persists and increases in value with every generation of workers. The International Research Council stands for co-operative effort among the men of all nations to extend the field of scientific knowledge and to distribute its splendid products. It merits hearty recognition among the nations. It is full of possibilities. A world-wide co-operation in pure science would promote an internationalism which, unlike the League of Nations, would not bring us into "fatal collision with the principle of nationality everywhere active and powerful." It is a type of community life which seems specially adapted to world-wide development, and if so developed should bring us nearer to the unification of mankind than any form of internationalism hitherto suggested. In pure science, communism is a natural law; rank, status, race, religion, nationality should count for nothing. The underlying principle here is the universalism of science and the catholicity of truth.

WILL DEVELOP SASKATCHEWAN SODIUM SULPHATE. A deposit of sodium sulphate was discovered last year south of Ceylon, Sask., from which, it is stated, according to a Regina news despatch, nine million tons can be taken out. New York interests have secured the property, it is understood. The owners of the property put their sale price at $3,000,000. It is proposed to erect a refinery on the property.

RECONSTRUCTING FRENCH CHEMICAL INDUSTRY

France has made notable progress in setting her chemical industry on its feet again. Although only 17 per cent. of the chemical plants of all kinds in France were located in the devastated departments these plants were almost entirely destroyed. The departments of the Nord and of the Aisne suffered particularly, supporting 70 per cent. of the total damage, which is estimated according to 1914 values to be 128,840,208 francs.

The Ministry of Liberated Regions, which has taken a census of the various plants that can be classed under the heading "chemical industry," announces that on October 1, 1920, 111 out of 142, or 78.1 per cent. had resumed operation wholly or in part. The greatest proportion in resumption of operation is found in the Lille region—89.3 per cent.

The production in 1914 of the plants which can be classed under the heading chemical industry proper was estimated at 850,000 tons. The present production is between 200,000 and 300,000 tons. Under this heading are included plants manufacturing sulphuric acid, nitric acid, chlorohydric acid, sulphates of sodium, iron copper, sulphites, superphosphates, ammonial salts and various fertilizers. No figures are yet available on the production of chemical byproduct factories, either for 1914 or at present. Under this heading are classed all factories which handle chemical products already prepared, such as salt refineries, the preparation of crystals of sodium, hypochlorites, pharmaceutical and hygienic products, photographic materials, etc.

The chemical industry in general throughout France has received great encouragement as a result of the war. Prior to 1914 the industry was of relatively minor importance, French manufacturers preferring to import the necessary supplies from Germany, which for years had specialized in this branch of industry. However, once the German supplies were cut off and the war showed the immense value of chemicals in the successful prosecution of hostilities, the French Government and private enterprise began to turn their attention seriously to the development of the industry in France.

The manufacture of powder, which is an important branch of the industry, is in the hands of the government, it being with tobacco, matches, etc., a government monopoly. It will only be necessary to cite a few figures on this one product to show what preeminence the chemical industry attained in the eyes of the French General Staff. The plan of French mobilization in 1914 included the following estimates:

Quantity of powder to be produced during the war—24 tons a day.

Quantity of other explosives to be produced during the war—none.

No one then supposed that the quantity of explosives on hand would not be sufficient for any war purposes. However, after the First Battle of the Marne, the pressing need of chemicals for powder and explosives began to develop. It was necessary to create factories almost over night to meet the ever-growing demands of the army. The original provisions, cited above, were doubled many times over to that by June 25, 1917, the estimates of army needs were the following:

Quantity of powder to be produced—640 tons a day.

Quantity of other explosives to be produced—1100 tons a day

All this productive capacity, no longer needed for war purposes, can be utilized to build up the chemical industry of France.

In this connection it is interesting to call attention to the recent French invention which simplifies the process of obtaining nitrates from the air, of which the Germans made so much during the war. The inventor is Georges Claude, the celebrated physician to whom France owes the creation of the liquid air industry. With a much smaller apparatus than that used in Germany, M. Claude is now able to produce a ton and a half of ammonia a day, which corresponds to seven tons of ammonia sulphate. The invention is of great importance because it will facilitate the production of ammonium chloride, greatly needed as a fertilizer by French agriculture.

Possibilities of Ceramic Industries in Nova Scotia

An Opportunity to Increase Exports and Diminish Imports*

NOVA SCOTIA is more liberally supplied with raw materials suitable for the use of the clayworker than any other province of the Dominion. This is in large part owing to the presence of Carboniferous Coal Measures, as this series of rocks in addition to the coal beds also contains numerous beds of clays or shales. Very valuable clay beds of Cretaceous age occur at Shubenacadie in Hants county, and in the Musquodoboit valley in Halifax county. These clays resemble the stoneware and fireclays of an extensive clayworking industry.

The late marine or Pleistocene clays are found at many localities, notably in the Annapolis valley and along the line of the Canadian National railways between Enfield and Shubenacadie. These marine clays are generally reddish in colour, occur on the surface, and are soft and stoneless. They furnish the raw material for a good charp red building brick, and for field drain tile or flowerpots.

The shale deposits are seen to best advantage in the Sydney, Inverness, and Pictou coal fields in natural exposures, either in cliffs along the Atlantic coast or along the sides of stream valleys. The shales are constantly encountered in coal-mining operations, especially when cross-cutting the measures from one coal seam to another.

A very complete description of these shale beds accompanied by the results of physical tests on samples collected from them is given in the report on Clay and Shale Deposits of Nova Scotia by Messrs. Ries and Keele, and published by the Department of Mines.

From this report we gather the information that all of the shale beds in the Carboniferous measures are plastic when ground and worked up with the required amount of water and consequently can be formed into ware of any desired shape by almost any type of clayworking machinery.

The list of ware that can be made from these shales includes common building brick, face brick, hollow building brick, sewer pipe, electric conduits, floor tiles, roofing tile, paving brick, firebrick, stove linings, garden urns, chimney flues, etc.

It is stated that while none of the beds in the Carboniferous measures are highly refractory except in one instance at Inverness, that there are several beds of semi-refractory shales in the Pictou coal field which are extremely useful in the steel industry or for the manufacture of sewer pipe or other vitrified wares.

The real fireclays in Nova Scotia are seldom found in the Coal measures but occur as soft beds of Cretaceous age at the localities given above. These clays are also used in the manufacture of stoneware goods.

One of the best refractory materials in the province is not a clay at all, but a hard rock known as felsite, a large deposit of which occurs at Coxheath not far from the city of Sydney. This material when crushed to the proper size and bonded with plastic fireclay makes a very superior grade of refractory brick.

The southwestern part of the province between Halifax and Yarmouth appears to be lacking in clays either of the hard or soft variety. At a few points in this district, there is a material of peculiar interest known as infusorial earth. This is a very fine grained siliceous deposit of organic origin and has many uses in the industries. Its chief use in the clayworking industry is in the manufacture of insulating brick, which is used to such great advantage in conserving heat in furnaces. A large deposit of this material occurs on the Liverpool river in Queens county.

In addition to the clay resources there are still other materials which are included under the general head of ceramics, one of the most important of these being silica rock. There are extensive beds of quartzite in Cape Breton which contain over 95 per cent of silica and are found to be suitable for the manufacture of silica brick.

Silica brick is becoming a very important item in metallurgical and by-product coke-oven practice and a large quantity, representing a good deal of money, for they are expensive, is imported into Canada every year. The Maritime Provinces are well provided for using clay products for structural purposes, as they possess a great variety of the raw material as well as the coal fuel for burning the ware, and now when wood is becoming expensive it is more difficult for it to compete with brick on the score of economy.

As far as structural materials are concerned the clayworking industry of Nova Scotia is confined at present to the manufacture of common red brick made from the surface clays. These bricks are used for face brick as well as for backing and filling, but if a face brick of special colour, finish, or texture is desired it is necessary to import them. Face brick which cannot be excelled by any imported article may be made from several of the shale beds in the Pictou coal field and at other localities.

Hollow building blocks, or fireproofing, as these wares are sometimes called, are not made in the Matriime Provinces, but their use is becoming very general in all other parts of Canada. They are cheaper to build with than brick and on account of the hollow spaces are said to make better walls in dwellings for withstanding the effects of extreme changes of temperature to living conditions. When housing problems are being considered all possibilities regarding the best material to use must be taken into account and when a suitable material is not being produced steps should be taken to encourage its manufacture.

Sewer pipe is made from certain of the shale beds in the vicinity of New Glasgow. This is an excellent glazed pipe and the facilities for output are ample to supply all the demand in the Maritime Provinces for this class of ware. A small quantity of field drain tile is made at the brick plant at Avonport, in Kings county.

Underdrainage of farm lands, is bound to increase when its benefits are realized, and a much greater demand for tile is sure to come in the future. Most of the surface clays mentioned in the report of the Department of Mines are suitable for the manufacture of agricultural tile.

Firebrick for lining the ladles used in the steel works are manufactured from the semi-refractory shales, which are mined with the coal at Westville. These brick are hard and dense in structure and give better satisfaction for ladle linings than a more refractory brick. There is a good deal of unnecessary use made of firebrick in many cases where a less refractory brick would do, so that the shales at Westville could be made into brick for many purposes where high refractoriness was not the only thing to be considered.

It is possible that some of these shales could be used for the manufacture of architectural terra-cotta, a material that is steadily increasing in use as a facing for business buildings in cities. This class of clay ware is not made at present in Canada.

Red and buff floor tiles or roof tiles can also be made from these shale beds. Large quantities of these goods are imported from Great Britain and the United States.

So far as can be ascertained, the manufacture of pottery has never been attempted in Nova Scotia, except by the small plant at Enfield, which makes the ordinary red flowerpots from the surface clay in its neighborhood.

There are excellent stoneware clays at Shubenacadie and Musquodoboit. At St. John, N.B., the clay from the latter point is used for making tea pots, bowls, jars, crocks, etc., and

*This memorandum was prepared by Mr. Joseph Keele, B.Sc., of the Mines Branch, Department of Mines, Ottawa.

is found very suitable for the purpose. The firm obtained its clay from New Jersey until a few years ago.

The tourist trade of Nova Scotia offers a good opportunity for the manufacture of clay wares for souvenir purposes. At present we have nothing to offer visitors in the way of ornamental work made of Canadian material by Canadian workmen or workwomen, except possibly some birch bark, deer skin or sweet grass articles.

Many visitors would gladly purchase small pieces of clay ware if they were of local manufacture, made from local materials, and had some distinctive qualities besides.

Clayworking with a view to developing this branch of its technique might readily be taken up by the technical schools, but so far they appear to have neglected this very important branch of manual training.

Several experiments have been made at the clay testing laboratories of the Mines Branch at Ottawa on the suitability of some of the clays of Nova Scotia for modelling and pottery-making. It was found that some of the stoneless brick clays of the Annapolis valley will make good red ware which can be enamelled with the ordinary majolica glazes.

The clays of Shubenacadie and Musquodoboit are excellent modelling clays which could be used for instruction work in technical schools and for making the finest kind of glazed art pottery.

THE PRODUCTION OF CASTOR OIL IN THE UNITED STATES*

The normal annual consumption of castor oil in the United States is over 2 million gallons, nearly all of which is manufactured locally from imported seed. The average imports of castor seed amounted annually to about 834,000 bushels (46 lb.) during the five years ending June, 1917. In 1917-18, owing to the great demand for castor oil for the lubrication of aircraft engines, the imports rose to over 1¼ million bushels, of which 60 per cent. came from India, 19 per cent. from South America, and 8 per cent. from the West Indies. Castor seed was grown locally in the United States, chiefly in Oklahoma, Kansas, Missouri and Illinois, until about 1900, when successful foreign competition appears to have rendered cultivation unprofitable; and although the activities of the Bureau of Aircraft Production resulted in 1918 in the production of 5750 tons (250,000 bushels) of American castor seed, the cessation of war and the increased world production of seed render the prospects of castor seed as a permanent American crop somewhat doubtful.

In the United States, castor seed is bought on a standard form of contract of the Linseed Oil Association of New York City; 5 per cent. of the bags of a consignment is sampled, and allowances are made for impurities (stones, husks, etc.—exceeding 3 per cent., and also for excessive amounts of broken, decorticated or "black" seed (*i.e.*, seed discolored by contact with water) which increase the acidity of the oil; the maximum allowance being about 5 per cent. At present it is not customary to value the beans on their oil-content as ascertained by analysis.

The treatment of castor seed in the manufacture of oil differs somewhat from that of other oil, seeds owing largely to the soft non-fibrous nature of the seed-kernels; and although decorticated seed produces oil of paler colour and causes less wear to machinery than whole seed, the majority of the oil manufactured is now produced from whole seed.

The seed is not ground before crushing, as the soft kernels make grinding difficult, or even unnecessary, and the active lipase present renders rapidity of working desirable. After the usual preliminary removal of impurities by screening, the seed is heated to about 110° F., with the object of rendering more mobile the heavy viscous oil. This is conveniently effected in a grain-dryer, in which the seed is exposed on a series of steel shelves to a current of hot air (with the introduction of steam when desirable), and from which the seed can be discharged continuously or intermittently. After heating, the seed is pressed immediately in cage presses, such as are now commonly used for various oil-seeds of high oil-content; pressures on the ram of 4000 to 6000 lb. per square inch are employed, and some mills are being constructed for pressures of 8000 lb. per square inch.

In good practice, 46 lb. (1 bushel) of seed, containing 45 per cent. of oil, yields about 15.6 lb. of No. 1 cold pressed oil, leaving in the press-cake 4.3 lb. of oil which can only be extracted by means of solvents. Castor seed is now treated successfully in Anderson oil-expellers, and the unsatisfactory results obtained in early attempts to use these machines for castor-oil manufacture are attributed to excessive wear caused by the hard seed-coats on the cast steel used in the construction of early machines. The cast steel has now been replaced by case-hardened steel.

Expellers, such as are used for copra, having three worm-flights on the pressing screw are satisfactory. Comparatively low pressures are used for castor seed, as high pressures lead to overheating of the oil and contamination with meal. In practice a cake about 7/16 inch in thickness and containing 12-15 per cent. of oil is obtained. In the battery of 15 oil-expellers at the Government oil-mill at Gainsville (Florida), each machine has worked regularly about 800 lb. of seed per hour when set to produce 15 lb. of oil per bushel (46 lb.). After several months work on castor seed, the machines showed even less wear than is observed when working groundnuts, and out of a possible "take-up" for wear of cones of 2½ inches, only ½ inch was necessary. Experiment showed that it was possible to produce a good yield of oil by the treatment in an oil-expeller of seed in the pod, but that the oil was of green colour and therefore unacceptable in ordinary trade, though suitable for lubrication and capable of being bleached. Decorticated seed was too soft to be worked in an oil expeller without the addition of some fibrous binder such as groundnut husks. As there is a considerable amount of oil (12-15 per cent.) in the cakes obtained from cage presses or expelllers, the material is treated with solvents in either stationary or rotating extractors. The types of extractors, solvent-recovery stills, etc., and the methods of working are similar to those used for other oil-bearing materials, but rotary extractors are increasing in favour, as they obviate imperfect extraction due to channelling and packing of the charge, are easy to work, and are less costly in labour than stationary extractors. In the latter there is a tendency for packing to occur owing to the fine non-fibrous albuminous matter of the kernels. This may be obviated by introducing the solvent from below and placing a layer of hulls (seed coat) on the floor of the extractor after covering the floor with burlap between wire-netting. Although castor oil is not soluble in petroleum spirit (gasoline) at ordinary temperatures, gentle heating effects solution readily. This solvent is used in practice and the residue after extraction only contains up to 2 per cent. of oil. Solvent-extracted oil obtained from press cakes has a green colour and is of No. 3 grade, but experiment indicated that oil of apparently No. 1 grade could be produced by bleaching the oil directly extracted from castor seed.

No. 1 castor oil, obtained by pressing or expelling, is of pale colour and is generally sufficiently low in acid content to be suitable for industrial purposes without refining by means of alkali; passing a current of live steam into the oil coagulates albuminous matter which can be filtered off. No. 3 oil is of dark colour and high acidity (generally 5-7 per cent. as oleic acid); the refining of such oil with alkali is troublesome, as the soaps do not break and settle readily, but only do so partly as they tend to dissolve in the oil.

Bleaching of castor oil is usually effected by agitation of the dry oil at about 200° F. with 2-4 per cent. of fullers earth for about ½ hour, followed by agitation with 0.2-1.5 per cent. of

*From a report by J. H. Shrader, U.S. Department of Agriculture, Bulletin 867.

decolorizing carbon and subsequent filtration. No satisfactory method was found for bleaching commercial No. 3 oil, and this is attributed to the fixation of the colour by heat and to the presence of iron salts in the oil.

Engine tests of No. 1 hydraulic-pressed oil, No. 1 expeller oil, and No. 3 refined oil showed no differences in the lubricating values; and the physical and chemical constants were practically identical, colour being the only distinguishing feature.

On account of its intrinsic difference from any other commercial vegetable oil, or by reason of its relative cheapness, castor oil finds application in many industries and manufactures, such as leather dressing, Turkey-red dyeing, artificial leather, rubber substitute, linoleum, etc. Although largely replaced by less expensive mineral oil as a lubricant, castor oil is still employed in the tropics for heavy machinery, and is essential for the lubrication of rotary types of internal combustion engines. The causes of its superiority for the latter purposes appear still to be somewhat uncertain. The imports to Canada of castor oil amount to about 175,000 gallons per annum, most of which comes from England.

THE PROBLEM OF DEVELOPMENT OF NATURAL RESOURCES.

Before the Publicity Association of Montreal on December 15th, Mr. C. Price-Green, Commissioner of the Industrial and Resources Department, Canadian National Railways, gave a striking review of Canada's natural resources emphasizing the great necessity of a proper development of them.

The development of the Dominion's resources, declared Mr. Price-Green, was one of the heaviest problems any country had to face. There should, however, be a spirit of optimism, particularly when this year's crop was considered. Total exports last year were equivalent to $117 per capita, compared with $65 in the United States. The manufacturer had recently been induced to seek trade abroad, said the speaker, by the action of the Government Marine.

He then reviewed the mineral resources of Canada, instancing the nickel and asbestos yields, which were 80 and 85 per cent. respectively, of the world's supply. With the advance of chemical industries, new markets were being found for many more mineral products of Canada.

The oil-fields in Northern Alberta were estimated to be able to supply oil enough for the next 100 years for all Canada, though in that connection there was the great problem involved of transporting the oil from the fields. That problem must be solved and undoubtedly would be.

Canada today had a paper industry which was exporting more than twice as much as Norway, Sweden and Finland combined.

In conclusion, Mr. Price-Green declared that if every Canadian would get behind the national movement to develop natural resources, and give every encouragement to the introduction of capital, Canada would become the individually richest country in the world.

SASKATCHEWAN'S INDUSTRIAL GROWTH.

While Saskatchewan is generally looked upon by Easterners as an agricultural province, as it primarily is, yet the fact that it has many growing industries is often overlooked. The total number of factories in the province is 208, employing 3,177 persons, and using 14,500 horse-power, according to the report of the Provincial Bureau of Labor and Industry for 1919-20. Saskatchewan's industries include, among others, 4 meat-packing plants, 10 creameries, 1 brewery, 22 flour mills, 21 machine repair shops, 7 brick-making plants, 45 automobile repair shops, 15 aerated water making plants, 6 tire and vulcanizing plants, 15 sash and door factories, and 2 sheet metal works.

MEMBERS OF CANADIAN INSTITUTE OF CHEMISTRY

Degrees and Postal Address, January 1st, 1921

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Chemical Society News

SHAWINIGAN SECTION, SOCIETY OF CHEMICAL INDUSTRY.

The inaugural meeting of the Shawinigan Falls Section of the Society of Chemical Industry was held at the Cascade Inn, Shawinigan Falls, on December 13th.

The meeting, which was attended by about sixty members of the Section with their guests, was preceded by a substantial dinner which was sampled, analysed both qualitively and quantitatively and consumed with 100% efficiency by the chemists and engineers present.

After the toast to the King, the Chairman Dr. F. W. Skirrow in a few well-chosen words outlined the steps leading up to the formation of a local section, and read a cablegram just received from Dr. Longstaff, Secretary of the General Council wishing the Section success in the occasion of its first meeting. He then called on Mr. George MacIntyre, who expressed the good wishes of the Montreal Section for the new member of the family of the Society of Chemical Industry.

The Hon. Walter Mitchell, Provincial Treasurer, in a masterly address sketched in broad lines the remarkable development of the province of Quebec in industry, transportation, and agriculture during the past few years. When one considered the tremendous natural resources and the great extent of territory of the province, one realised that the surface had barely been scratched. Few realized that the area of this one province of Quebec was one quarter of that of the United States and five times that of the United Kingdom. The Gouin administration had greatly increased expenditure on good roads, education, aid to agriculture, and public works, stated the speaker, but in such a judicious manner that the per capita debt had actually decreased during the past few years, a phenomenon unique in recent political history. The Government had encouraged and aided the development of water power, always keeping to the policy of leaving the business in the hands of private capital, and so happy had been the outcome that the Government actually derived a profit from the undertaking, over and above the fixed charges, while the companies were enabled to sell power at very low rates. It is interesting to note that of the 19,000,000 available horsepower in Canada, 6,850,000 was in the Province of Quebec, and of this 875,000 had been developed.

Referring further to water power development, Hon. Mr. Mitchell pointed out the great era of progress that had been ushered in following the development of the St. Maurice River. The power of the St. Maurice River had built the great industrial towns of Grand 'Mere and Shawinigan Falls and transformed Three Rivers from a country village into a thriving city.

The Gouin Dam at LaLoutre, which cost the province about $2,500,000 has a reservoir of 300 square miles and impounds 160 billion cubic feet of water, twice as much as the Assonan Dam in Egypt. It doubled the available horse power on the St. Maurice River. The Government was now studying possible developments in other parts of the province in order to encourage rapidly expanding industries.

In closing ,the speaker made a plea for economy, co-operation between capital and labor, good sense, and good engineering in the difficult times which are now upon us, and predicted a future period of even greater prosperity than we have had in the past.

The next speaker was Mr. T. H. Wardleworth, Vice-President of the General Council of the Society who has for many years been prominent in Canadian chemical industry.

Mr. Wardleworth opened his remarks by welcoming the new Section into the brotherhood of the Society of Chemical Industry, which he pointed out was not merely British, but Impeiral in its character, and he was pleaased to be able to endorse, as the Vice-President, the cabled greeting of the President and Council from London.

In his remarks he referred to the great changes which had taken place in the application of science to industry during a short period of his own lifetime and mentioned some of the memories of his youth which showed what extraordinary advances had been made in one short lifetime. The period of "trial and error" had given way to the insistence upon exact methods based upon well ascertained facts, thus enabling the chemist to reasonably hope as to the result, not only as to his laboratory experiments but the industrial development of new processes. Reference was made to the great care which Faraday bestowed upon experiments in working out his theories, and the interesting point was made that while Faraday's mechanical, and physicial opportunities would not permit him to carry his experiments to the successful demonstration, his theories were proved to be true upon the advent of modern advantages as to pressures and the creation of vacua. A direct appeal was made to the new members of the Section to realize that with the great strides which have been made in placing new powers in the hands of the chemists of today by the aid of electricity and otherwise, that the world should expect a marked advance from such a centre as Shawinigan, and therefore it behoved everyone to see that these expectations were realized.

Turning to the question of capital with relation to chemical industry, Mr. Wardleworth dwelt upon the importance of the capitalist and drew attention to the want of education on the part of the wage earners to habits of thrift and appealed for a better understanding between the two, whose vital interests were after all bound by their active co-operation. With regard to labor itself, it had to be borne in mind that it was not always a question of hours and wages, and in connection with the cosmopolitan labor of a country like Canada, the problem was intensified. No doubt the efforts to realize some of the aspirations and ideas of the members of the "melting-pot" section would lead to the fact that they could be interested and made contented by some concession to their national customs and habits and this might probably be desirable for the benefit of the whole community.

Concluding, the speaker hoped that the success of Shawinigan and its industrial chemists would be such that it would become a shrine to which other industrial chemists would be tempted to tread a path.

A vote of thanks to the speakers was moved by Mr. Stadler, and seconded by Mr. Witherspoon, and after a graceful response by Mr. Wardleworth, the meeting adjourned.

F. E. Dickie,
Secretary-Treasurer.

TORONTO SECTION, SOCIETY OF CHEMICAL INDUSTRY.

It was the very good fortune of the members of the Toronto Section, Society of Chemical Industry, to have as the speaker at the December meeting of the Section, Dr. R. A. Morden. formerly of the British Cellulose Company. The subject of Dr. Morden's address was "Cellulose Acetate." Dr. Morden brought to his subject the experience of four years' service in the manufacture of cellulose acetate for the British Government during the war, as director of plant operations for the British Cellulose Company. Up to the outbreak of the war, cellulose acetate had never been manufactured in England. Almost at once it became a necessity for aeroplane "dope" and now has several possible industrial uses of some magnitude.

At the commencement of his address, Dr. Morden pointed out that, prior to the war, knowledge relating to the manufacture of cellulose acetate was mostly confined to Germany, although there was one factory producing it in France and one in Switzerland. The latter plant, operated by the Dreyfus Brothers,

was known to have the best process, and after negotiations, the British Government made a bargain with the Dreyfus company, by which their process was to be open to investigation by a British agent. For this most important post, Dr. Morden was chosen. His success on this mission was essential, both to Britain and America's success in air fighting.

The British Cellulose Company undertook, as one of three concerns, to manufacture cellulose acetate, and Dr. Morden, upon his return from Switzerland, was placed in charge of operations.

Naturally, Dr. Morden could not disclose any points of the process as revealed and studied by him in Switzerland. Regarding the actual manufacture, he gave a general outline of the process for the manufacture of cellulose acetate, basing his remarks on the processes contained in Worden's book on the celluloses, but making revisions and comments where the processes given in the book are incorrect or out-of-date. The raw materials necessary to the manufacture are: celllulose (paper, cleaned or bleached cotton); acetic acid; acetic anhydride, and a catalyser, generally sulphuric acid or zinc chloride. The glacial form of acetic acid is required. The selection of the proper grade of the raw materials is in itself a difficult problem. The process may be divided into two main divisions, acetylation and hydrolysis or ripening.

The acetylation is stopped by the addition of water, the resulting mixture being soluble in chloroform-alcohol. The stage of hydrolysis is stopped just where the mixture is soluble in acetone, and great care must be taken not to allow the action to go too far; otherwise a compound entirely different to cellulose acetate will result.

The applications of cellulose acetate, as illustrated by numerous samples Dr. Morden displayed, were many. One was as a window for tropical countries, made by painting a layer of the cellulose acetate over a wire screen. Other samples were different forms of celluloid, such as films, artificial silk and imitations of leather coverings for books. In connection with the artificial silk, some beautiful samples were shown.

Its chief property as a celluloid, which makes its commercial use so valuable, is its non-inflammability. Its resistance to water makes its use as an insulator for electric wiring valuable. An example of this latter use was instanced by Dr. Morden in the case of a Canadian concern which has great difficulty and considerable expense in keeping a motor in operation, because of its situation, where water dripping and dampness effected its running. The motor was taken out and dipped in a solution of cellulose acetate, and thereafter kept running perfectly.

An interesting discussion followed Dr. Morden's address, in which many present joined, concluding with the passing of a hearty vote of thanks to the speaker.

Mr. M. L. Davies, Chairman, presided, and the usual informal dinner preceded the address. The Secretary, Mr. T. E. Rothwell, read a communication from Mrs. E. M. Ellis, widow of the late Dean Ellis, past-chairman of the Toronto Section, thanking the members for their letter of condolence and expression of sympathy in her recent bereavement. In her letter, Mrs. Ellis stated that the Society always had an important place in her late husband's life.

It was announced that at the January meeting of the Section, to be held January 28th, Mr. W. A. P. Schorman, of the British American Oil Company, would give an address on "Oil Refining," illustrated by four reels of motion pictures. The chairman, Mr. Davies, appealed to those present to make the attendance at that meeting as large as possible.

MONTREAL SECTION, SOCIETY OF CHEMICAL INDUSTRY.

"The Explosive Industry" was the subject treated at the December meeting of the Montreal Section of the Society of Chemical Industry, held at Queen's Hotel, December 17th. There was a splendid turnout of members and the keenest interest was shown in the papers presented. Mr. Charles R. Hazen, Chairman, presided. The symposium on "Explosives" was given in four papers by members of the staff of Canadian Explosives, Limited, Montreal. The first paper was on "Acids and Raw Materials" by Mr. T. R. Ballantyne followed by a paper on "Nitro-Glycerine" by Mr. A. M. Chesney, "Dynamite and Gelatine" was the subject of Mr. T. W. Smith's paper, while Mr. R. F. Pollard concluded the symposium with a paper on "Black Powder." The papers presented were excellent, handled in a masterly style, and reflected great credit on the gentlemen who prepared them. Following the papers Pathescope pictures were shown illustrating the use of explosives on the farm in the removal of stumps in clearing ground for plowing and for the planting of trees. These were shown by courtesy of Canadian Explosives, Limited. The usual informal dinner opened the proceedings at which several choruses were rendered by the members in proper style, Mr. H. Brook presiding at the piano. Two solos were also rendered by Mr. Brooks in a pleasing manner.

OTTAWA SECTION, SOCIETY OF CHEMICAL INDUSTRY.

On Tuesday, December 14th, at five o'clock, a special meeting of the Ottawa Section, Society of Chemical Industry, was held in the Projection Room of the Exhibits and Publicity Branch of the Department of Trade and Commerce for the purpose of viewing motion pictures entitled "The Story of Coal" and "The Manufacture of Coal Mining Machinery." The films were loaned to the Society through the courtesy of the Sullivan Machinery Company of Chicago and proved very interesting, being an excellent protrayal of the subject with which they dealt.

CHEMISTRY IN THE BALL-ROOM

The general use of chemical terminology would seem to be spreading if the programme of the dance recently held under the auspices of the Montreal staff of the Standard Chemical Company be any indication. The dance was held in celebration of the opening of the Company's new laboratory and office extension building. Some of the dances were:—"Chloroform Waltz"; The "Crude English" Fox Trot; "That Wood Alcohol Jag"—One-Step; The "Charcoal Baby Jazz"—One-Step; The "Ethereal Waltz"; The "Acetone Glide"—Fox Trot; The "Semi-Refined"—One-Step; The "Aspirin Dip"—Fox Trot; The "Vinegar Rag"—One-Step.

SECOND REPORT OF JOINT PEAT COMMITTEE.

The Second Report of the Joint Peat Committee appointed by the governments of Canada and Ontario to investigate the practibility of producing a satisfactory fuel from peat is embodied in Part I of the 29th Annual Report of the Ontario Department of Mines, 1920, recently issued. The report of the Committee describes the experiments carried on at the bog at Alfred, Ontario, with two machines of different type. Delays in the construction of the machines prevented their being used in 1918, and the season of 1919 begun with one plant (No. 2), an altogether new and novel design, partly erected on the grading of the old Alfred railway siding, and the other plant (No. 1), loaded on cars held on the main line of the Canadian Pacific Railway. No. 1 plant was the Anthrep plant, while No. 2, as stated, was a machine of entirely new design. Difficulties from holes and soft spots prevented plant No. 2 from being put into manufacturing operation before the end of the 1919 season, though other difficulties in connection with the mechanism of the machine were readily overcome. Plant No. 1, the Anthrep machine was put in operation on the old working face on a well-drained part of the bog, and manufacturing of peat could be commenced at once. A certain amount of peat fuel was manufactured with Plant No. 2, but this machine was not operated for this purpose, but for observing difficulties and remedying them. The princi-

pal feature in the design of Plant No. 2 (the Moore machine) is the arrangement for replacing the ordinary track system, cars, cable ways, etc., for transporting the pulp and placing it in the drying field. This is effected in the Moore system by means of a bridge 150 feet long attached at right angles to the peat machine. As stated, the ground in which the machine was tried out was too soft, and alterations to the bridge arrangement were necessary As it was about 800 tons of peat fuel were manufactured by Plant No. 2 during its try-out.

Plant No. 1 manufactured over 2,000 tons of peat fuel, and its capacity per day increased steadily up to the time operations were discontinued. With the information which the Peat Committee has at hand for this season's mechanical try-out and operations, they have every reason to expect an average output of six tons per hour for each machine during a normal season. This output it is expected will be exceeded with Plant No. 2; six tons per hour, however, is looked upon as a conservative average hourly production.

Sufficient data concerning mechanical difficulties and weak points in the design of both machines were obtained to enable the Peat Committee to put the machines in first class working order for the season of 1920.

The total cost of production from No. 1 Plant was $3.00 per ton, and from Plant No. 2 $2.25 per ton. The Committee hope, that when the operations for the season of 1920 are all completed that these will confirm their estimate of $3.50 per ton as the price at which peat fuel can be sold f.o.b. Alfred. This quotation may be slightly reduced. The total expenditure at Alfred up to December 31st., 1919, was $110,250.53, of which amount $23,215.76 was for Committee expenses including $11,180.65 to E. V. Moore for engineering and management; $73,827.53 for plant equipment; and $9,130.76 for operation.

ANNUAL REPORT, ONTARIO DEPARTMENT OF MINES, 1920.

Perhaps no better examples exist of what a government department can really do in the way of laying information before the public than the Annual reports of the Ontario Department of Mines, such as have been issued from that department during the past five or six years. The 29th Annual Report, 1920, just recently issued in four separate sections, maintains the high standard of excellence of former reports and good progress is shown in several sections of the report in the art of compiling statistics and presenting them in a readable and interesting style. The report is far removed from being a "dry as dust" government blue book such as is too often the popular opinion regarding government publications. The work of the Ontario Department of Mines, like most other government departments, owes its excellent high standard in a very large degree to the Deputy Minister, Mr. Thos. W. Gibson, who has guided the affairs of this department in a most able manner for a number of years. The report is in four parts, each a separate book. Part I contains the Statistical Review of the mining industry of Ontario by W. R. Rogers, the Department's capable and energetic Statistician and Topographer. In the sixty pages devoted to this Review Mr. Rogers presents a veritable wealth of information concerning every mineral mined in the Province, giving the names and addresses of the producers of these minerals. The numerous tables necessary in presenting such statistics are interspaced with descriptive paragraphs written in a bright and interest-holding manner. Another section of Part I of special interest to chemists is the Second Report of the Joint Peat Committee prepared by B. F. Haanel, an abstract of which appears in this issue of this journal. Other sections in Part I are, a Report on every mine in Ontario, by T. E. Sutherland and his assistant inspectors; A Geological Reconnaissance into the District of Patricia, by E. M. Burwash; and Windy Lake and Other Nickel Areas, by Cyril W. Knight.

Part II of the report deals with the geology of the Abitibi and Mattagami Rivers districts, by J. G. Cross, M. Y. Williams and Joseph Keele.

Part III consists of sections on the Ben Nevis Gold Area, by C. W. Knight; West Shiningtree Gold Area, by P. E. Hopkins; Matachewan Gold Area, by A. G. Burrows; Argonaut Gold Mine, by C. W. Knight, and Gowganda Silver Area, by A. G. Burrows.

Part IV is the second report by A. G. Burrows and P. E. Hopkins on the Kirkland Lake Gold Area, the most productive gold field in Ontario except Porcupine.

ONTARIO METALLIFEROUS PRODUCTION

Returns received by the Ontario Department of Mines from the metalliferous mines, smelters and refining works of the Province for the nine months ending September 30th, 1920, are tabulated below, and for purposes of comparison the quantities and values are given for the corresponding period in 1919. Tons throughout are short tons of 2000 lbs.

ONTARIO'S METALLIFEROUS PRODUCTION, FIRST NINE MONTHS 1920.

Product.		Quantity 1920	Quantity 1919	Value $. 1920	Value $. 1919
Gold	ounces	424,297	366,288	8,735,768	7,574,586
Silver	"	7,831,143	7,475,396	8,435,088	7,898,220
Platinum Metals	"	213.75	8,726	13,917	4,981
Nickel (Metallic)	lbs.	7,060,078	7,820,866	2,440,303	2,732,676
Nickel oxide	"	4,886,712	5,700	1,146,768	1,607
Other Nickel Compounds	"	159,725	217,135	15,362	22,279
Nickel in matte exported*	tons	17,446	11,301	8,723,000	5,424,552
Cobalt (metallic)	lbs.	159,151	93,227	373,168	174,782
Cobalt oxide	"	509,043	321,483	1,015,696	463,916
Other Cobalt comp'nds	"	1,717	29,491	1,629	18,250
Lead, pig	"	1,290,726	1,481,204	117,122	54,802
Copper (metallic and sulphate)	"	4,952,413	4,436,101	800,369	756,883
Copper in matte exported*	tons	9,497	6,818	2,659,160	1,908,936
Iron Ore†	"	5,468	5,827	47,120	44,234
Iron, pig‡	"	49,422	30,849	1,395,918	795,009
Total		——	——	35,920,418	27,875,713

*Copper in matte form was valued at 14 cents and nickel at 25 cents per pound in both years. Total matte produced was 44,922 tons, of which 31,800 tons were exported. For further details see heading "Nickel-Copper."

†Shipments of iron ore totalled 89,931 short tons valued at $445,355. The figures in the table cover shipments to points other than Ontario blast furnaces.

‡Total output of pig iron from both domestic and imported ore was 512,559 tons worth $14,480,794. Figures in the table represent proportional product from Ontario ore.

GOLD.

Ontario's gold output for the first three quarters of 1920 was 421,297 fine ounces worth $8,735,768, an increase of $1,161,182 or 15-1/3 per cent. over the corresponding period in 1919. During the period 977,475 tons of ore were milled, distributed as follows: Porcupine, 903,945 tons, Kirkland Lake 69,328 tons, and Miscellaneous, 4,242 tons. The disabilities under which gold mining has been carried on are gradually being removed, the power situation alone excepted. Details of gold production are presented herewith:

Porcupine.		Kirkland Lake.	
Hollinger	$4,620,800	Lake Shore	$371,359
McIntyre	1,603,376	Kirkland Lake	215,558
Dome Mines	1,515,086	Teck-Hughes	182,152
Northcrown	70,406		
Porcupine Crown	70,962	Total:—	$769,069
Dome Lake	46,809	Miscellaneous Mines	23,904
Davidson	11,210	Recovery from Nickel-copper refining	4,146
Total:—	$7,938,649		
		Grand Total:—	$8,735,768

Miscellaneous mines include the production by Argonaut Gold, Limited, in the township of Gauthier, Contact Mines Bay, Limited, near Dryden, and W. E. Stone of Mine Centre. In addition to gold output 71,990 ounces of silver were produced, worth $80,420. The 150-ton mill of the Wright-Hargreaves mine at Kirkland Lake is nearing completion.

SILVER COBALT

Silver production increased from 7,475,396 to 7,831,132 ounces during the period as compared with 1919. With the exception of 32,073 ounces recovered from nickel-copper refining and 71,990 counces from gold refining operations, the output came from Cobalt, Gowganda and outlying areas. Power shortage and a rapid decline in the price of silver will have their effect on the output for the last quarter of the year. The average price of silver was $1.33 per fine ounce in January and 94 cents for September, with an average of $1.09 for the 9 months' period. On Dec. 1 the price dropped to 69¾ cents for foreign silver on the New York market. Mines shipping over a half million ounces are given in order: Nipissing, Mining Corporation, O'Brien, Coniagas and Kerr Lake.

Refineries: During the period 426 tons of ore, 2,651 tons of concentrates and 2,117 tons of residues were treated in Southern Ontario refineries for a recovery of 2,406,880 ounces of silver in addition to arsenic, nickel, cobalt and compounds of the two last mentioned metals. A small output at Welland of nickel and cobalt compounds is reported by Ontario Smelters and Refiners, Limited, successors to Metals Chemical, Limited. Copper sulphate was marketed to the extent of 98,918 lbs., the metallic equivalent being included in the total copper production. Silver producers were paid for 18,202 lbs. of copper recovered in United States refineries. A considerable increase is noted in the price of cobalt, but more recently the general slump in prices of metals has seriously affected the business of silver-cobalt refineries. The out-

put of 203,953 lbs. of metallic nickel and 20,711 lbs. of nickel oxide from silver-cobalt ores is small as compared with the product of Canadian nickel-copper refineries.

NICKEL COPPER

During the period 925,378 tons of ore were raised at the Creighton, Murary, Garson, Levack, Bruce, Victoria No. 1 and Worthington mines. Ore smelted at Copper Cliff, Coniston and Nickelton totalled 809,022 tons, from which 44,922 tons of bessemer matte were produced. To the United States and Wales 31,800 tons of matte were exported, while 12,531 tons were treated in Canadian refineries at Port Colborne, Ontario, and Deschenes, Quebec.

At the beginning of the year smelting of nickel-copper ores was back again to a pre-war basis after the greatly curtailed production in the early part of 1919, which followed an abnormally large output in 1918. Although production has increased from 30,942 tons of bessemer matte for the first 9 months of 1919 to 44,922 tons for the corresponding period in 1920, conditions since Sept. 30th have considerably reduced this rate of production. The present market for both nickel and copper is dull and stocks have accumulated. In consequence the International Nickel Company of Canada were obliged to curtail operations both at Copper Cliff and Port Colborne on Nov. 1st to the extent of 25 per cent., which reduces the output to 300 tons per month of bessemer matte and 400 tons of refined nickel.

In the bulletin for the half year ending June 30th it was stated that nickel-copper matte was in process of treatment at the new refinery of the British America Nickel Corporation at Deschanes. Electrolytic nickel and copper were produced during the latter part of the nine months' period. The International company markets a considerable part of the nickel in the form of oxide.

IRON ORE AND PIG IRON

During the period 135,023 short tons of ore were mined by the Algoma Steel Corporation and Moose Mountain, Ltd. Of this total 84,463 tons (nodulized) were shipped to Ontario blast furnaces. Shipments of briquettes produced from magnetite ore were 5,468 tons worth $47,120.

The furnaces of the Standard Iron Company at Deseronto, Midland Iron and Steel Company and Parry Sound Iron Company have not been in blast since June, August and October respectively in 1919. Four stacks were operated by the Algoma Steel Corporation at Sault Ste. Marie, two by the Steel Company of Canada at Hamilton, and one by Canadian Furnace Company at Port Colborne. Of a total of 1,036,229 tons of ore smelted only 99,916 tons or 9.64 per cent. was of Ontario origin. In steel making 252,797 tons of pig iron product were used. The total steel output at Sault Ste. Marie and Hamilton was 525,084 tons worth $19,253,470.

BOOK REVIEW

THE MANUFACTURE OF CHEMICALS BY ELECTROLYSIS.

By Arthur J. Hale. D. Van Nostrand Co., New York. 80 pp. $2.00 net.

The manufacture of chemicals by electrolysis is now an important branch of the general group of industries to which it belongs This little monograph reviews the processes that have had some success, and points out the general field that is being opend up. The variety of applications mentioned may be rather surprising to those who have been connected with recent developments in a general way only. The seven chapters are headed as follows:—

(1) Electrolytic hydrogen and oxygen ozone.
(2) Production of par-salts and hydrogen peroxide.
(3) Nitric acid, hydroxylamine; hydrosulphites; fluorine.
(4) Electrolytic preparation of pigments and insoluble substances.
(5) Electro-osmotic and electro-colloidal processes.
(6) Electrolytic reduction of organic compounds.
(7) Oxidation and substitution of organic compounds.

New South African Dye.

Reuter's Cape Town correspondent reports that two South African chemists are engaged in manufacturing a vegetable dye which may have a revolutionary effect on the dyeing industry. The dye is stated to be absolutely non-injurious to any fabric.

Madras Indigo Crop.

The first report of the Director of Agriculture on the indigo crop of 1920-21 states that the area sown up to September 1st was 59,000 acres, as against 65,300 acres last year. The yield is estimated at about 600 tons. The area under indigo in Madras is usually about just over fifty per cent. of the total area under this crop in British India.

MINING AND METALLURGY IN BRITISH COLUMBIA

(Special Correspondence to Canadian Chemistry and Metallurgy).

The slump in the price of copper has practically knocked the bottom out of the copper-mining industry in British Columbia, for the time being, at any rate. The Britannia Mining & Smelting Company ceased production in the latter part of November, Granby Consolidated Mining & Smelting Power Company followed by a sharp curtailment in production and the discharge of 400 men, and on the 9th of December Canada Copper Corporation closed after being in operation for only seven weeks. At the time of closing the directors of the Corporation made the following announcement: "Owing to the low price of copper, which has been gradually dropping for the past few weeks until it has reached an alarmingly low figure, it has been necessary to close down the mine and plant at Copper Mountain and at Allenby. The Canada Copper Corporation is in a position to operate at as low a price as any other company, and if the price trends upwards to such a figure as concordant with the present cost of supplies and scale of wages allow the company to make a fair profit, operations will be resumed." Some weeks before deciding to close, the Corporation asked the men to accept a reduction of 50 cents per day in their wage-scale. This, after holding a number of meetings, the men refused, and the inevitable shut-down followed. With a few unimportant exceptions, the copper deposits of the Province are low-grade, several of the companies operating are heavily handicapped by either unduly large capitalization or heavy bonded indebtedness, and the result is that it is practically impossible to produce copper profitably when the price of the metal falls below 15 cents· that is, with the present cost of wages and supplies. The complete closing of Canada Copper and the rigid curtailment of operations by Granby and Britannia have thrown from 1000 to 1200 men out of work. A large proportion of these men have shared in the benefits of the good times when copper was bringing good prices, and if they had had a little wider vision and had been willing to accept a wage reduction now, these closing of operations would not have been necessary. It is likely, too, that the reduction would have been only for a comparatively short time.

Copper Companies in Difficult Position.

The position of the Granby Company at the present time is far from an enviable one, as it reflected in the share market. At one time during 1916 Granby shares reached the high mark of $120. Today, December 16, they are quoted $15 on the Vancouver market. The reason is obvious. Towards the close of the war, Granby, after three splendid years, started to branch out in other lines of business. It bought coal areas on Vancouver Island, developed and equipped the Cassidy colliery, and provided excellent accommodation for the comfort and contentment of its employees; it erected a battery of 30 by-product coke-ovens and made a number of improvements at its smelter. At the time these improvements were started it was the intention of the directors that they should be paid for out of the earnings, and there was every indication that such a programme would be possible. With the armistice, however, came the slump in the price of copper, labor troubles and a fire at the Anyox plant followed, and the colliery enterprise was not a marked success. Consequently, instead of being able to pay for the improvements out of earnings, two loans had to be floated, together totalling $4,003,300, and drawing an annual interest of $209,198. The purchase of the coal lands, owing to the insecurity of their title, has plunged the company into heavy litigation costs, and it is not at all certain that title will be obtained to them in the end. The case is still before the courts, the last verdict going against the Granby Company. Neither have the coal lands been a success metallurgically. The coke produced has a very high ash that has given considerable trouble in the blast-furnaces.

It has been necessary to buy other coal to mix with the Cassidy coal.

Looking on the brighter side, Granby has a reserve in its Hidden Creek mines of 11,000,000 tons of smelting ore that will run 2.21 per cent. of copper, and it has an even larger reserve of lower grade ore that at ordinary times it is believed might be profitably concentrated. The smelting plant is in excellent physical condition, and the Cassidy colliery, should the title ultimately be cleared, is producing 20,000 tons of ore a month, a large proportion of which is sold. Best of all, Granby is associated with some very strong financial interests that undoubtedly will put the company on its feet again if at all possible.

The closing of the Canada Copper Corporation's mine and plant is sufficient evidence that the Corporation cannot operate profitably with copper where it is today. Recently the Corporation was reorganized under Dominion Government charter with a capital of $10,000,000. The total investment, mine, plant, railway, and power line can be little, if any, less than $8,000,000. The railway was built by the Kettle Valley Railway, a subsidiary of the C.P.R., and is a branch of that system. The power-line was built by the West Kootenay Power Co., a subsidiary of the Consolidated M. & S. Co. Canada Copper claims to have developed 10,000,000 tons of actual ore and 2,000,000 tons of probable ore averaging 1.77 per cent. copper. It has erected a crushing plant at the mine and a 2000-ton concentrating plant at Allenby. All this will be closed and the capital tied up until either the price of copper advances or the cost of supplies and wages come down to a point where profitable work can be undertaken. During the short time it was running, the plant was not tuned up to more than one-third total capacity, but the management stated that it was giving complete satisfaction.

Having no heavy indebtedness to carry, Britannia is believed to be in a better position to weather the present siege of bad times than any other copper producing company on the Pacific Coast. Development work is being continued, and should the price of copper advance—which hardly seems likely in the immediate future—or other conditions justify, the plant will be re-started at once.

Sullivan Mine Continues Active.

The Consolidated Mining & Smelting Company continues to keep up the output of its Sullivan zinc-lead mine and of its lead and zinc plant. The company had made arrangements to treat the Canada Copper Corporation's concentrate and had gone to considerable expense in the way of new equipment with that end in view. No official statement has been made, but it is likely that the copper department of the smelter will be closed when the ore and concentrate on hand has been treated. This would be hard on some of the small concerns that look to Consolidated to treat its ores; but it is difficult to see from where enough ore is to come to keep the copper furnace in operation. During the depression in the price of base metals, the Company has closed-down all but absolutely necessary construction work, and has laid off a considerable number of men who were employed on it. Construction work that has been stopped includes work on the 2500-ton concentrator to treat the Rossland ores, the 2500-ton concentrator to treat the Sullivan mine ore, and the copper-rod mill.

Claim to Engineer Mine Dismissed.

On December 8, judgment was rendered by Justice Morrison dismissing the claim of W. Pollard Grant, of Vancouver, for a one-fifth interest in the Engineer gold mine, at Atlin. This frees from litigation and renders open for negotiation what is probably the richest gold mine in the province. The mine was under option to the Mining Corporation of Canada in the fall of 1918, and engineers were sent to examine it. They were drowned with the owner of the mine, Capt. James Alexander, in returning from Atlin on the Princess Sophia, after making the examination. Since that time the title to the mine has been in dispute. Two of the largest Ontario silver companies are said to be looking interestedly toward the property, from which some fabulously rich ore has been taken.

Recent B.C. Incorporations.

Among the new incorporations are the Coast Range Steel, Ltd., with a capital of $15,000,000 and head office in Vancouver, and Rossland Velvet Mines, Ltd., with a capital of $300,000 and head office at Rossland. The Velvet mine has been shipping ore steadily throughout the present year. Of the new steel company no trustworthy information seems obtainable. It is said to be backed by British capital, and arrangements have been made with the Provincial Government for a $3 bounty on all metal produced from British Columbia ore during the first three years of the company's operation. The Provincial Government through the Department of Industries has granted a loan of $250,000 to finance the amalgamation of the Port Moody Rolling Mills with two small producers of iron from scrap in electric furnaces.

BRITISH COLUMBIA INDUSTRIAL NOTES

Sodium Carbonate Plant.

The Soda Mining & Products Company will erect a new evaporating plant at Soda Lake, near 70-Mile House on the old Cariboo stage road. The Company has applied to the Provincial Government for a spur-track from the Pacific Great Eastern Railway, which is owned and operated by the Government, to the Lake.

Soda Lake is situated at an elevation of 3700 feet above sea level, is 100 acres in extent, and the waters have a sodium carbonate content of six per cent. The total sodium carbonate content of the lake has not been determined. The supply is believed to be replenished by springs. There are a number of smaller lakes with about the same sodium carbonate content in the neighborhood. In 1918 the Pacific Coast Contractors, Ltd., erected a small evaporating plant capable of producing two to three tons of sodium carbonate crystals per day of 10 hours. The plant is only three miles from the railway.

Pulp Mill Changes Management.

T. W. McGarry, president of the Whalen Paper and Pulp Mills is in British Columbia to superintend the taking over of the management of the company's three plants by the Reliance Mill & Trading Corporation, of New York. John Ball, president of the Reliance and formerly with Price Brothers Co., of Quebec, and U. M. Waite, formerly manager of the International Paper Company, are to take personal charge of the plants, and will be assisted by M. Carrigan, who is an expert sulphite pulp man. The Whalen Company owns three plants in British Columbia, situated respectively at Swanson Bay, Port Alice, and Howe Sound. The three plants were designed to produce 70,000 tons per year, but, despite the shortage of paper, they never have approached capacity. It is the aim of the new management to bring them up to full produciton. Mr. McGarry will remain in British Columbia until the new management is in full charge of operation. He stated that the Reliance would choose its own staff, but would have no supervision over the office in Vancouver.

New Brewery for Kamloops.

The Ranier Brewing Co., which prior to the enactment of prohibition operated several large breweries in Pacific Coast cities in the United States, has purchased the Imperial Brewery at Kamloops, B.C., and will spend $75,000 in making extensions and improvements to the plant. The company will manufacture beer for domestic and for export trade. It plans to ship on an average three cars of beer daily, and not less than 60 men will be employed. Much of the company's business will be export to the Orient. The new buildings will be started at once; the work is in the hands of W. S. Ramsay, of Vancouver.

Overseas and Foreign Notes

(Specially Prepared by Correspondents for Canadian Chemistry and Metallurgy.)

New German Rubber Process.

The following extract from a patent specification of Farbenfabrik vorm. Fried. Bayer & Co., Leverkuson, Cologne, for a method of preparing a soft and elastic vulcanisate, has been forwarded by the British Commercial Secretary at Cologne to the Department of Overseas Trade (Development and Intelligence) in London:—

Patent No. D.R.P. No.326819, February 20th., 1917: It has been ascertained that antimony pentoxide added to raw rubber, regenerated rubber, etc., accelerates the vulcanization and acts as a colour former. By means of such addition a red vulcanisate is secured which has the properties of great softness, tensile strength, elasticity, and durability. Example: 100 parts by weight of raw rubber, regenerate or artificial rubber are mixed with four parts of sulphur, 10 to 15 of antimony pentoxide, and under a pressure of three atmospheres vulcanized in half an hour.

Swiss Exports of Chemical Products.

The exports from Switzerland of chemical products during the first six months of this year exhibit a considerable rise, as may be seen from the following table:

	1919 Million Frs.	1920 Million Frs.
Aniline Dyes and Indigo........	48.00	115.3
Pharmaceutical Goods..........	16.1	31.3
Chemicals..	4.6	11.7
Total:—.........	68,700,000	158,300,000

The two biggest markets, taking together 60% of Swiss exports are France and her Colonies and the British Empire; followed by Belgium, the United States, China and Japan. There is a constant demand for analine dyes, but owing to the difficulty experienced in procuring raw materials, the supply has not been sufficient to keep pace with the demand for many months past.

New Cotton Substitute from Woodpulp.

A German technical paper has a description of a new method of preparing wood fibres for spinning, which is said to yield good results, and to produce a perfect substitute for cotton. Instead of attempting to preserve the best fibres in their full length for spinning, as a substitute for long-fibre textiles, the fibres are separated into their original cells, varying between 20 and 50 millimetres in length. The separation process consists first of hydrolysis, the dried material being soaked in a weak acid solution, as the result of which part of the incrusting matter is carried off in solution. The remaining part is easily soluble by the next process, which consists in handling the material with alkali solutions for between six and twelve hours. By this process the long fibres are entirely separated into their short elementary cells. As, however, after drying, the cells again stick together, and as washing only partially prevents this they are put into an isolation solution of fatty acids or amides thereof. After this process the cells dry in a condition which, it is said, makes sticking together impossible, yielding a soft, strong material, which can be easily spun by the cotton spinning three-cylinder system.

Magnesium From Sea Water.

A prominent Norwegian scientist, Professor Helland Hansen, in a lecture on the possibilities of the utilization of sea-water for obtaining raw material for Norwegian industry, declared that the Norwegian salt works at Bergen would be able to produce nearly 500 tons of salt and 100 tons of metallic magnesium, besides gypsum and other chemical products. The raw materials used were sea water and electric energy. Metallic magnesium was 35 per cent. lighter than aluminium and an alloy with 80 per cent. of magnesium had excellent qualities, and was most profitable for use in all motors, especially for those of aeroplanes, automobiles and electric tramcars.

Chemicals in Uruguay.

The Uruguayan Government is proposing a great extension of the activities of the Institute de Quimica Industrial in the direction of the production of chemicals required in peace time and indispendsable in the event of war. The industries which it is proposed to establish include a sulphuric acid factory with a daily capacity of 25,000 kilogrammes; a nitric acid factory, with a capacity of 10,000 to 15,000 kilogrammes every day; a factory for the production of crude benzole, toluol, xylene and carbolic acid; a caustic soda factory on the electrolytic system, yielding as by-products chlorine and hydrogen, producing a ton of caustic soda daily; a factory for the production of alcohol and sulphuric ether; works for the production of acetic acid, glycerine and the preparation of cotton; a powder and explosives factory. The approximate total cost of these works is estimated at 2,180,000 pesos, and it is proposed to engage five foreign technical experts, the amount set apart for this purpose being 25,000 pesos yearly.

Electro-Chemical Industries in Sweden.

Waterpower is appropriated for the generation of electricity in Sweden up to 1,000,000 t.h.p., about one-third of this being used by industrial concerns, and the remainder by distributing stations, although so far as the ultimate use of the power is concerned, industry consumes 94 per cent., the electro-chemical industry accounting for 32 per cent. The most notable developments have taken place recently in the electro-chemical industries (electrolytic, electro-technic and electro-metallurgical), this being illustrated by the fact that in 1908 only ten works of this kind were in existence in Sweden, with an output worth 7,500,000 kronor and an energy consumption of 18,000 h.p., while in 1917 no less than 75 enterprises were working, with an output of 55,000,000 kronor and a consumption of 171,000 h.p. The new plants include the manufacture of silicious and pig-iron; iron alloys; some 50 Rennerfelt steel furnaces; zinc; carbide; carbide noitrogen; sulphate of ammonia; chlorides and perclorates; carborundum; graphite electrodes; phosphorus; aluminium; magnesium; potash compounds and cyanides, etc.

New Electro-Plating Process.

Mr. Frank Mason, lecturer in Electro-Plating and Electro-Chemistry at Sheffield University, announces the discovery of a new process which experts in the electro-plating industry claim will increase output by a hundred per cent., and may in addition save thousands of dollars on plant and equipment. The process is stated to have been successfully worked on a limited scale and has given an increase of 100 per cent. in productivity from the plating baths, and there is said to be evidence that further experiment will produce much more startling results. The discovery has relation to the fact that the rapidity at which the deposition of silver on any article that is being electro-plated depends on the strength and quantity of the electricity put into the chemical plating bath to secure that result. At the present time, if the electric current is increased beyond a given standard the "plate" is spoiled ("burnt"), although the plating is more rapid. Mr. Mason has, however, discovered that by varying the chemical composition of the plating bath (the electrolyte, as it is called) it is possible not only to more than double the current of electricity put into the bath, and thereby make it do the work twice as quickly, but also to get a "plate" of the finest and the best. In other words, he has discovered how quick plating can be done without "burning."

THE BRITISH CHEMICAL INDUSTRIES IN 1920.

From our London Correspondent.

The chemical industries of the United Kingdom have suffered probably to as great a degree as any during the past year from both the threat and the actual experiencce of coal strikes, from the increased transportation charges on raw materials and finished products, from difficult labour conditions due to the high cost of living, from the enhanced cost of coal and raw materials, as well as from the violent fluctuations in demand which have resulted from the effects of these same conditions upon the various users of chemical products. In spite of every obstacle, however, remarkable progress has been made as is evidenced from thefact that during the ten months ended October 31st last exports of chemicals, drugs, dyes and colours produced in Great Britain amounted to £34,111,682, as against £21,524,949 during the corresponding ten months of 1919, the figure for the last similar pre-war period being £16,617,808, since which time prices have of course swollen very greatly. Imports of chemicals, drugs, dyes and colours have also risen, the figures being 28,683,134 for the period January to October 1920 and 16,815,394 for the first ten months of 1919. The imports during the corresponding period in 1913 were £11,082,707. Increases have taken place in exports of practically every description of chemical product, dyestuffs notably rising from 259,676 for the pre-war period to £1,248,548 during the first ten months of 1919, and to £2,967,248 for the corresponding period just past. Other coal-tar products exported are vulaed at £2,498.055 for January to October, 1920, as compared with £1,159,097 for January to October 1919, and £1,296,124 for the corresponding months of 1913.

The British Dyestuff Industry.

These figures alone afford evidence that the British dyestuff industry has responded in an admirable manner to the call made upon its resources and initiative during the war and since the Armistice. The output of dyes is now stated to exceed the country's total consumption in pre-war days. Dyestuffs manufactured on British soil in 1913 scarcely reached 1,000 tons; to-day the productive capacity of the industry has reached between 25,000 and 30,000 tons, as against a total pre-war consumption in the United Kingdom of 21,000 tons. This achievement is even more remarkable when it is realized that dyestuff chemistry, important as it was considered during the war, could not possibly in those days, when the premier place was given to explosives, receive the undivided attention from both scientific and commercial standpoints which it deserved and which it is receiving at the present time It was generally recognized at the beginning of the war that the task before the British dyestuff producers was collossal, and that years of uncomplaining loyalty on the part of dye-users would be necessary to place the British dyestuff industry on a competitive basis as compared with the highly-organized industries of Germany, which in 1914 had a capital amounting to £60,000,000 and an annual productive capacity of 135,000 tons, against which Great Britain had an industry capitalized before the war at considerably less than £1,000,000 and still little more than £12,000,000. While much has been done during and since the war in regard to the establishment of the dyestuff industry in the United Kingdom, frequent complaints are still made that the delivery of dyes from British sources is abnormally slow, and that products of the vat type and the colours of more difficult preparation are not forthcoming sufficiently readily. The handicap laid upon British textile manufacturers, whose pre-war reputation owed much to the virtues of the German aniline dyes used by them in such large quantities, is enormous, especially in coping with export business under conditions which limit their range of colours, and there is no doubt whatever that the need for development and courageous enterprise in the dyestuff industry is just as pressing to-day as it was during the war. It is, therefore, satisfactory to record that one concern at least, and the largest of all, the British Dyestuffs Corporation, now employs over 300 highly-trained chemists' including a hundred men who have honours degrees, working on research and other work, in addition to some 7,000 operatives of various descriptions. The supply of trained organic chemists who have specialized in this branch of chemistry is, however, still small, and until the number available is vastly increased the strides made in either research or production are hardly likely to enable the manufacturers to fulfil quickly all the demands of the textile and other industries dependent upon them for colours.

Fine Chemicals.

British manufacturers of fine chemicals generally are doing well in spite of greater competition from abroad, and it has become the rule both in the United Kingdom and overseas for many users to ask for a guarantee that goods purchased are of British manufacture. Vanillin, for instance, is preferred in spite of the fact that the price asked for it is often several shillings more per lb than that demanded for the Continental or American product; and the same state of affairs operates in the demand for salicylic acid, salicylates, synthetic perfumes, essential oils, alkaloids, photographic chemicals, pharmaceutical drugs and disinfectants. A feature of the fine chemical trade has been the spasmodic demand for saccharin, the price and small supply of sugar in England being the chief factor in the situation.

The heavy chemical market has since the armistice maintained a very strong position. The question of coal supply has of course been a most influential factor in the situation, short supplies being directly reflected in a scarcity of acid, alkalies, &c., and consequently higher prices. The demand for soda, potash, bleaching powder, bichromates of potash and soda, Glauber's salt, mineral acids, phosphates and fertilizers in general has been fairly consistent in advance of supply both for home and export trades. In the glue, geletine, phosphate and related chemicals industry a feature of the past year has been the consolidation of several British manufacturers with a view to reducing costs of production and pooling resources for chemical and technical research. In this matter of research, a very noteworthy example of the importance with which research has come to be regarded in the United Kingdom is the voting by one firm, Messrs. Brunner, Mond & Co., Ltd., of £100,000 for this purpose within the past few weeks. The heavy chemical industry is frequently regarded by chemists as not being fraught with the possibilities of the organic branch so far as research is concerned. There is, nevertheless, a very wide scope for discovery in inorganic chemistry; especially in the production and refining of non-ferrous metals is there much opportunity. Zinc, lead, copper, aluminium tin, etc., all come within the range of products upon which research work is very necessary.

Motor Fuel.

The high prices and scarcity of motor fuel have since the war engaged the atttention of chemists upon the discovery of some other fuel besides petrol and benzol. The use of power alcohol has been discussed at great length, and incidentally one of the most interesting developments in chemical industry since the armistice has been the discovery of a process for economically converting the ethylene obtained from coke over gas into alcohol. Previously the sources suggested as suitable for the production of power alcohol had been mostly vegetable—sugar cane, cellulose, corn, and starches in general, cassava, tropical vegetation, Bassia or Mowra have all been put forward as solutions of the problem all these having, from the British point of view, as a serious defect that they are bulky materials which would have to be imported into the United Kingdom at great expense from abroad. Until the conversion of ethylene into alcohol was suggested, therefore, the idea of the use in the United Kingdom of power alcohol languished. Calcium carbide has also been suggested, and a Swiss firm is stated to have produced alcohol at as low a figure as one shilling per gallon from this cource—which announcement is of interest to Canadian manu-

facturers. With regard, however, to the production of alcohol from ethylene contained in coke oven gas, the process is worked at Skinningrove (Yorkshire) with such success that seventy per cent. of the ethylene present in the gas is utilized, and there is a seventy-per cent. conversion of this ethylene into alcohol. It is expected that production at the plant now in course of erection at the Skinningrove works will amount to more than 23,500,000 gallons of alcohol per annum.

The general tone of the chemical market in Great Britain towards the close of the year was distinctly quiet, as the result of the coal strike and of the general trade depression. The prices of many articles still have a downward tendency, and inquiry for export has almost completely dried up. The prevailing depression in trade is, however, generally felt to be temporary, and conditions should be better towards the end of the winter, provided that peace is maintained and some progress made in the restoration of stable conditions on the Continent and elsewhere.

BRITISH INDUSTRIES FAIR.

Arrangements have now been completed for the reception of a record number of visitors to the British Industries Fair which opens on the 21st of February in London and Brimingham and on the 28th of February at Glasgow. This fair comprises the largest number of exhibitors of British and Colonial manufacturers ever assembled in one trade fair.

The first British Industries Fair was held in London in 1915 and the success which has attended the fairs held since that date has satisfied the Department of Overseas Trade as to the correctness of the system of organization.

The services which are rendered to the invited buyer do not end with the mere bringing together under one roof of the chief British manufacturers. Every possible assistance is given to him in finding the particular articles he wishes to buy. The resources of the British Government are at his call. In the Fair buildings the Department of Overseas Trade opens fully staffed offices in order that buyers and exhibitors may obtain authentic information on all points of importance. Mr. F. W. Field, the British Government Trade Commissioner at Toronto, will be in attendance at the London Fair and will be pleased to meet and assist all visitors from the Dominion.

The Department's help does not stop with advice and information. Material arrangements are made for the buyer's comfort and assistance at the Fair. Interpreters are provided for his use free of charge. Special writing rooms are set apart for his convenience, where he can carry on his correspondence. Special Post Offices deal with his letters and telegrams. Restaurants and tea rooms make it unnecessary for him to leave the Fair buildings to get his meals.

Visitors to the Fair also receive valuable assistance from the manner in which the catalogues of the Fair are produced. Instead of being mere lists of the names of the exhibitors, they are books of reference in which they can find in their own language a classified index of every article exhibited. Supplementary pages contain tables of English and foreign weights and measures compared; and the monies of all the principal countries are compared with their English equivalents. These are not sold, but are handed gratis to all visitors to the Fair from overseas.

Buyers from overseas who wish to visit the Fair should apply as early as possible to the nearest British Trade Commissioner at Montreal, Toronto or Winnipeg, from whom they will be able to secure full information. On their arrival in England it would be to their advantage to communicate at once with the Secretary, British Industries Fair, 35 Old Queen Street, London S.W., or, should the Fair have commenced, at the White City, Shepherd's Bush, London, W.14.

Intending visitors will do well to secure hotel accommodation in advance, and Messrs. Thomas Cook and Sons with their world-wide organization will provide every facility for doing this, whether the accommodation required is of the kind provided by the largest and most luxurious establishments, or of a quieter and more modest description.

PRODUCTION OF STEEL AND PIG-IRON IN CANADA.

The total production of steel (including ingots and direct steel castings) in Canada during the first nine months of 1920 according to statistics collected by the Mines Branch of the Department of Mines, Ottawa was 945,282 short tons, or an average of 105,931 tons per month as compared with a total production during the corresponding period in 1919 of 770,053 tons and an average monthly production throughout the whole of 1919 of 86,157 tons. The production of steel during the nine months—included: 901,188 tons of ingots and 44,094 tons of direct castings. The production in electric furnaces was 18,323 tons and in open-hearth, converter, crucible or other furnaces 926,959 tons.

The total production of pig-iron in Canada during the first nine months of 1920, was 806,488 short tons (800,608 tons made in blast furnaces and 5,880 tons made in electric furnaces from scrap steel) as compared with a production during the first nine months of 1919 of 710,114 short tons. The average monthly production of pig-iron during the first nine months of 1920 was 89,610 tons as compared with an average monthly production throughout 1919 of 76,482 tons.

The blast furnace plants active during the first nine months were those at Sydney and North Sydney, N.S.; Hamilton, Port Colborne, and Sault Ste. Marie, Ontario. The blast furnace plants at Midland, Parry Sound, Deseronto, and Port Arthur, Ontario, were idle throughout the period.

At the end of September 10 stacks were active and 8 idle.

Pig-iron was made from scrap iron and steel at four electric furnace plants located at Hull, Montreal and Shawinigan Falls, Quebec; and Orillia, Ontario.

LATEST CANADIAN CHEMICAL AND METALLURGICAL PATENTS

Reported by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same hy writing to Patent Office, Ottawa, Canada.

Manufacture of Nitric Acid of Highest Concentration.
M. Moest and M. Eckardt, 206819, December 21, 1920. HNO_3 the percentage strength of which is higher than that of the acid of lowest vapor pressure is heated without additional substances, the vapors are passed through a fractionating column in which the temperature is kept at a degree corresponding with the desired concentration and the vapors passing over are condensed.

Diacalcium Phosphate.
Walter Glaeser, 206573, December 14, 1920. Phosphate rock is heated with HCl and after the mixture thus formed has cooled to 30° the liquid product is treated with $CO(OH)_2$ to form amorphous di-Ca phosphate sol. in NH_4 citratrate. The precipitate is filtered and the remaining Ca phosphate dried.

Alloys.
F. Milliken, 206729, December 21, 1920. An alloy which resists high temperature and is easily machined contains Cu 56-64%, Ni 13-17%, Zn 10-15%, Fe 10-15%.

Alloy.
Foster Milliken, 206730, December 21, 1920. An alloy capable of being worked while hot contains Cu 40-48%, Ni 8-12%, Zn 38-48%, Fe 1-6%. Mn 1-3%.

Solder for Aluminium.
Ragnar Iversen, 206456, December 14, 1920. An Al solder contains Sn 60%, Zn 35%, Cu 4%, Al 0.15% and Mn 0.85%.

Corrosion Resisting Ferrous Alloys.
Silas McClure, 206651, December 21, 1920. An alloy containing Fe and in excess of .5%, Cu will withstand the action of the products of combustion of fuel.

Blasting Cap Charge.
Chas. M. Stine, 206311, December 7, 1920. A compound used in charges for blasting caps for primers in the detonation of high explosives consists of an organic compound having therein a nitro group and nitrate group and a priming material $C_6H_2(CH_2NO_3)_2(NO_2)_2$, $C_6H(OH)(CH_2NO_3)_2(NO_2)_2$, $C_6H_2(CH_2NO_3)_3NO_2$ or $C_6H(CH_3)(CH_2NO_3)_2(NO_2)_2$ may be used with a priming charge of Hq fulminate.

Explosives.
Wendell R. Swint, 206330, December 7, 1920. An explosive contains gun cotton of high nitration 40% liquid nitroxylenes 25% and $NaNO_3$ 35%. Gun cotton of a lower degree of nitration may be used in certain proportions.

Potassic Phosphoric Acid Fertilizers.
A. Messerschmitt, 206574, December 14, 1920. A mixture of K containing material reactive phosphoric compounds and an amount of reactive Cu compounds containing at least 40% of CaO estimated upon the amount of natural material is heated to a temperature slightly below the m.p.

Alloys.
Foster Milliken, 206644, December 21, 1920. An acid resisting alloy contains Cu 50-60%, Ni 28-36%, Zn 4-8%, Fe 4-8%.

Soldering Fluxes.
Oliver P. Greenstreet, 206545, December 14, 1920. A soldering flux is composed of Zn, HCl, citronellol and $CuSO_4$.

Alloys.
Fred M. Beckett, 206785, December 21, 1920. An alloy containing Cr 10-45%, Mn 3-25%, C. 0-3%, Si 0-3% has high resistance to oxidation a low magnetic permeability relative to steel or cast Fe and is responsive to heat treatment.

Explosives.
Leon L. Bryan and W. R. Swint, 206329, December 7, 1920. An explosive contains nitro-glycerine 5%, trinitrotoluol 40% and $NaNO_3$ 55%.

Hard Lead Alloys.
Geo. H. Worrall, 206787, December 21, 1920. A hard Pb alloy containing one or more of the alkaline earth metals has its hardness increased by the presence of .10-.25% of Hq.

Alloys.
Calvin Vos, 206713, December 21, 1920. An alloy having degassifying and deoxidizing properties for treating steel contains Al 90-95%, Mg 2-10%, NaF.01-5%, UO_2 .10-6% and FeSi .2 to 3%.

Artificial Fertilizers.
Heinrich Heimann, 206568, December 14, 1920. Fertilizers which can be easily distributed are made from fertilizing salts without drying by mixing a hot concentrated solution of NH_4NO_3 or melted NH_4NO_3, which contains water with an inorganic salt.

Method of Producing Gas.
Lindon W. Bates, 206182, December 7, 1920. A stable mobile fuel comprising liquid hydrocarbon and pulverised solid carbonaceous material is atomixed into an ignited mixture of air and steam in a generator heated to a temperature sufficient to transform the solid particles and the liquid hydrocarbon into gas, the ash is removed and the gas washed to remove tar and lampblack therefrom.

Explosives.
A Voight, 206392, December 2, 1920. Salts of the sulphoacids of nitrocresol are thoroughly mixed in suitable proportions with nitrates, chlorates and perchlorates of Na.

Metal Alloy.
E. Flugel, 207038, December 28, 1920. Brass or Bronze is made more suitable for bearings, etc., by the addition of up to 34% Zn, 3% Al, 5% Zn, 3%Pb, subject to a variation in the alloy of 30% of any individual metal.

Incendiary Composition.
G. W. Webb, 206374, December 7, 1920. The composition comprises granulated Mg, a nitrate and MgO formed into a coherent mass by compression.

Treatment of Peat.
Wm. B. Bottomley, 206416, December 14, 1920. Peat is moistened with a solution of NaCl to develop nucleic acid derivatives therein, it is then heated under conditions to retain the water therein and innoculated with micro-organisms. The temperature is maintained at a point suitable for bacterial growth.

Match Ignition Composition.
Wm. H. Dixon, 206346, December 7, 1920. The composition comprises a printing varnish, PbO_2, amorphous P and a thinning agent (turpentine) and may be applied to a label or wrapper by a printing operation.

Stahle Surface Alloy Steel
Percy A. E. Armstrong, 206587, December 21, 1920. An alloy steel contains Cr over 10%, C over .05%, Si over .5%, and over twice the C, Cr and Si together over 13% and the principal portion of the remainder Fe.

Ternary Alloy.
Leon Guillet, 206784, December 21, 1920. An alloy contains Zn, Ni and 25-45% Cu, the percentage of Ni being greater as the percentage of Cu is smaller .5 to .40% Pb may be added to make the alloy more easily worked.

Alloys.
Foster Milliken, 206645, December 21, 1920. An acid resisting alloy capable of withstanding high temperature contains Fe 16-20%, Cr 5-7%, Cu 31-38%, Ni 38-46%, and Mn $\frac{1}{4}$-$\frac{3}{4}$%.

CATALOGUES AND REPORTS RECEIVED

"SPENCER DELINEASCOPES AND BAUSCH & LOMB BALOPTICONS."

These are the names of two booklets distributed by the Hughes Owens Co., Ltd., Montreal, descriptive of these two well-known lines of stereopticans. Now that "lantern slides" have become a part of almost every technical address delivered either in class-room or convention the latest information on these instruments will prove useful to many.

"OPTICAL METHODS IN CONTROL AND RESEARCH LABARATORIES."

Small Royal 8vo. pp. 30, Price, post paid 1s. 8d.

This little book is one of several worthy publications on light, color, and scientific instruments used in connection with the applications of color or light, published by Adam Hilger, Limited, 75a Camden Road, London, N.W.1, England. Some of the subjects treated are The Spectrometer and Spectrograph for emission spectra, Absorption spectra and spectrophotometry, Refractometers, Polarimetry. Other publications by the same company are Refractive Index, Absorption, Wavelength and Rotatory Power in relaton to Molecular Structure, by Ludwick Silberstein; Tables of Refractive Indices, compiled by R. Kanthack and edited by J. N. Goldsmith, Ph.D., M.Sc., F.I.C.; Elements of the Electromagnetic Theory of Light; Elements of Vector Algebra; and Report on the Quantum Theory of Spectra; the last three being by Ludwick Silberstein. The publishers being in the business of manufacturing scientific instruments have treated the subject from a practical viewpoint that is commendable.

"SUPER-FILTCHAR, WHAT IT IS, WHAT IT DOES"—

In 1913 the Industrial Chemical Company, 5th Ave. Bldg., New York, placed upon the market a decolorizing carbon which gained a considerable reputation under the name of Filtchar. Although the product gained a considerable reputation, the company were convinced that Filtchar was not the last word in decolorizing carbon and after prolonged research work, the product Super-Filtchar resulted. This is produced as two different products, one for oils and fats; the other for glycerine, lactic acid, sugar and aqueous and alcoholic solutions. The properties and uses of the product are well outlined in the booklet issued free by the Company.

"CHEMICAL PRODUCTS."

The Monsanto Chemical Works, Saint Louis, U.S.A., have published a catalogue under the name "Chemical Products" that deserves special mention. The catalogue differs from most catalogues in that it gives the specifications of all the products listed, the chemical formula for each one, and compares them with the B.P. and U.S.P. The booklet as a matter of printing and lithographing sets a very high standard indeed. Beautiful engravings showing the exterior and interior of both their heavy chemical and pharmaceutical plants are shown. Special prominence is given to the new synthetic camphor plant erected by the Monsanto Company at East St. Louis during the past year. The process for producing the camphor has been developed only after many years of experimenting and research. Some of the products described are:—Acetanilid, phenacetin, coumarin, glycerophosphates, phenol, phenolphthalein, saccharin; Acetanilid (technical), Anthranilic Acid, Mono--Chlorbenzol, Ortho—Chlor—Para—toluene sodium sulphonate, Ortho—Nitro—Chlorbenzol, Para—dichlorbenzol, Para—nitrophenol, Para—toluene sodium sulfonate; Ammonium Chrome Alum, Hydrochloric Acid, Nitre Cake, Mixed Acid, Nitric Acid, Salt Cake, Sulphuric Acid, Zinc Chloride.

Chemical, Oil and Metal Markets

The quotations below represent manufacturers' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

CHEMICALS

January opened with the chemical market in a somewhat better condition than during December. It cannot be said that there has been any strengthening to the market, but the general feeling among manufacturers and dealers is that the outlook is brighter. This optimism has some real reason for existing from the fact that enquiries are just a little more frequent and from the business proposition that buyers cannot hold off much longer. As in December, conditions are much worse in the American market than here, despite the fact that New York actions generally set the pace for all of North America. New York dealers do not look for a diminishing of the "buyers' boycott" or unwillingness to buy for probably two months yet. During the past ten days import chemicals have almost swamped the New York market in several lines, notably ammonium chloride, ammonium sulphate, barium chloride, caustic potash, potassium carbonate, potassium bicarbonate, and yellow prussiate of soda.

At Toronto and Montreal bleaching powder has eased off and some lots were quoted at four cents during the past week. One of the few chemicals showing advances has been sodium bichromate but it cannot be said just how long this advance movement in sodium bichromate will last. Sulphuric and

muriatic acids are holding practically the same as in December though lower quotations may be obtained on large orders. Producers of these acids feel that on account of the high cost of production of these acids at the time they were made that they cannot sacrifice any further cuts. In the American market some dealers are quoting such ridiculously low prices on muriatic that those who know production costs doubt the ability of the quoters to deliver the acid at the price quoted. It must be said that the low quotation of four cents on bleaching powder is not the prevailing market price but is on a few odd lots brought in from the United States, which while apparently purchased at a higher figure, is being sold off in anticipation of receiving more at a lower quotation. Other lines showing some strengthening are soda ash, and potassium bichromate.

The trading in pharmaceuticals continues weak and the outlook is not very encouraging at the opening of the new year. Quotations have reached such a low figure in some lines that producers absolutely refuse to reduce further, preferring to lose business. Manufacturers feel that as price cutting to the point of sacrifice did not stimulate buying, they are now prepared to "sit tight" and wait for the buyers to begin something.

METALS.

The year 1920 was a favorable business period for the Coniagas Reduction Company, Limited, the reports presented at the annual meeting in December being highly satisfactory, comparing favorably with the two preceeding years. The total assets of the company are valued at $6,734,972. The tonnage of ore mined in 1920 was 97,634 as against 71,743 in 1919. The company received an average of $1.225 an ounce for silver during the year as compared with $1.06 in 1919. The output of silver from the mine during 1920 was 994,235 ounces while in 1919 the output was 940,267 ounces. This production was obtained from 97,634 tons of ore hoisted and concentrated. During the year dividends and bonuses amounting to 12½% were paid. In January 1919 the company acquired the 35-acre property immediately north of their own property, from the Tretheway Silver-Cobalt Mine, Ltd., for $100,000 including buildings and equipemtn.

The company have in view greater economy in production and management during the new year. In common with all other Northern Ontario mining concerns the Coniagas has felt the bad effect of the intensely dry season which prevailed in the North Country all summer and fall, lowering the water levels to such an extent that it is doubtful whether the necessary power will be available to operate the mines during the latter part of the present winter.

Steel.

Few changes in quotations in steel at either Montreal or Toronto are noted. Business generally has improved somewhat in anticipation of building operations in the spring. A note of warning has been sounded by a writer in a recent bulletin of the Department of Trade and Commerce, Ottawa, regarding the grave danger of Germany obtaining a strong position in the steel business of the world. The fact is that Germany is offering structural steel in the British market at a price lower than any other nation can afford to do. The reason is, of course, the low wages paid in Germany as compared with Great Britain and America. The "New York Commercial" points out that unless the exchange situation is speedily improved "German factories will have no difficulty in underselling the factories of other nations, despite tariff walls and other trade obstacles."

Copper.

Copper continues weak and the end of the year saw another British Columbia copper concentrator close down and two curtail operations. The copper companies well claim that they cannot produce with copper at 15 cents per pound or less and continue in operation and pay the high wages demanded by the miners' federations. The British Columbia operators offered their men a reduction of 50 cents per day and to continue operations but the men, ruled by their union bosses refused the compromise and are now out of work. The compromise was offered with a promise that as soon as possible the wages would be returned to their former level, but even this reasonable offer was turned down by the men.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals.

Inorganic.

Alum, Ammonia, lump and ground	100 Lbs.	6.50— 6.75
Ammonium Bromide	Lb.	.. — .75
Aluminium Sulphate, high grade, bags	100 Lbs.	. — 4.75
Ammonia, Aqua 26	Lb.	.11— .12
Ammonium Carbonate	Lb.	.20— .22
Ammonium Chloride	Lb.	.15— .20
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .12
Barium Sulphate (Barytes)	Per Ton	40.00—45.00
Barium Chloride	Lb.	.05—.07½
Barium Nitrate	Lb.	.. — .2[illegible]
Barium Sulphate, B.P.	Per Ton	.. —120.00
Bleaching Powder, 35% drums	100 Lbs.	.. —.06½
Borax, crystals	Lb.	.. — .10
Boric Acid, powdered	Lb.	.19— .20
Calcium Carbide, car lots, f.o.b. works	Ton	.. —100.00
Calcium Carhide, ton lots, f.o.b. works	Ton	.. —105.00
Calcium Carbide, less than ton lots, f.o.b. works	Ton	.. —110.00
Caustic Soda, ground, drum	Lb.	.06½—.07½
Caustic Soda, ground, drums, larger amts	Lb.	.06—.06½
Calcium Chloride, fused	Per Ton	58.00—60.00
Camphor Monobromate	Lb.	.. — 3.00
Carbon Bisulphide, in drums	100 Lb.	.. — .12
Carbon tetrachloride, drums	Lb.	.. — .21
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	35.00—45.00
Cobalt Oxide, black	Lb.	.. — 2.10
Copperas (Iron Sulphate) crystals	Lb.	.. — .03
Copperas (Iron Sulphate) sugar	Lb.	.. —.03½
Copper Sulphate (Blue Vitriol)	Lb.	.09—.09½
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 1.45
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Ferric Chloride, crystals	Lb.	.16—.16½
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid, 60%	Lb.	.. — .32
Hydrofluoric Acid, 30%	Lb.	.. — .14
Hydrochloric Acid, carboys, 18	100 Lbs.	3.00— 3.25
Hydrogen Peroxide	Gal.	.. — 1.05
Iodine, crude	Lb.	.. — 4.75
Iodine, resublimed	Lb.	.. — 5.25
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lithopone	Lb.	.09½—.10½
Magnesite, calcined	Per Ton	.. —25.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.18— .20
Magnesium Sulphate	Lb.	.04— .05
Mag. Sulphate, B.P., Medicinal	Single Ton	90.00—95.00
Mag. Sulphate, B.P., Technical, car lots	Ton	70.00—75.00
Muriatic Acid, 18	100 Lb.	3.00— 3.25
Nitric Acid, 36 carboys	100 Lb.	.09¼—.09½
Phosphoric Acid, 85%	Lb.	.43— .50
Phosphoric Acid, 50%	Lb.	.29— .31
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. — .65
Potassium, Bromide, granular	Lb.	.. — .60
Potassium Bichromate	Lb.	.. — .40
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — ..
Potassium Chlorate	Lb.	.. — .18
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots		.. — .27
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots		.38— .40
Potassium Hydroxide (Caustic Potash)	Sticks	.. — 1.00
Potassium Iodide	Lb.	4.00— 4.25
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.. — .75
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Silver Nitrate	Lb.	12.00—14.00
Soda Ash, bags	Lb.	.03—.03¼
Sodium Acetate, ton lots or over	Lb.	.. —.12½
Sodium Acetate, lesser amounts	Lb.	.. — .15
Sodium Benzoate	Lb.	.. — 1.15
Sodium Bicarbonate, 100% pure	100 Lb.	3.85— 4.00
Sodium, Bichromate, bbls.	Lb.	.20— .25
Sodium Bisulphite, powder	Lb.	.. —.09½
Sodium Bisulphite, 35	Lb.	.05¼— .06
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.32— .34
Sodium Hyposulphite, kegs	100 Lb.	5.00— 5.75
Sodium Nitrate, refined	100 Lbs.	7.28— 8.00
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	.. — 2.75
	Per Cwt. in Car Lots	.. — 2.25
Sodium Sulphite	Lb.	.. — .07
Sodium Prussiate, Yellow	Lb.	.35— .40

Sulphur, ground	100 Lb.	2.75— 3.00
Sulphur, roll	100 Lb.	4.50— 4.75
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.75— 3.00
Talc, No. 1 grade	Ton	.. —35.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	..—18.00
Tin Chloride, crystals	Lb.	.40— .45
Tri-sodium Phosphate	Lb.	.08¼— .09
Ultramarine, Blue	Lb.	.20— .50
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting (English)	Ton	.. —40.00
Whiting (American)	Ton	.. —35.00
Whiting	Per Ton	35.00—40.00
Zinc Sulphate, com.	Lb.	.06—.06½
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.12— .15
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.80— .85
Acetic Acid, 28%, carload lots	Lb.	.. —.04½
Acetic Acid, 28%, 25 bbl. lots	Lb.	.. —.05¼
Acetic Acid, 28%, 15 bbl. lots	Lb.	.. —.05½
Acetic Acid, 28%, 10 bbl. lots	Lb.	.. —.05¾
Acetic Acid, 28%, 5 bbl. lots	Cwt.	.. — 5.85
Acetic Acid, 28%, 3 or 4 bbl. lots	Cwt.	.. — 5.90
Acetic Acid 28%, 1 or 2 bbl. lots	Lb.	.. — .06
Acetic Acid, 80%, carload lots	Lb.	.. — .12
Acetic Acid, 80%, 25 bbl. lots	Lb.	.. — .14
Acetic Acid, 80%, 15 bbl. lots	Lb.	.. — .15
Acetic Acid, 80%, 10 bbl. lots	Lb.	.. —.15½
Acetic Acid, 80%, 5 bbl. lots	Lb.	.. — .16
Acetic Acid, 80%, 3 or 4 bbl. lots	Lb.	.. — .17
Acetic Acid, 80%, 1 or 2 bbl. lots	Lb.	.. —.17½
Acetone, pure, drums or over	Lb.	.. — .28
Acetone, pure, lesser amounts	Lb.	.. — .33
Aspirin, in 100-lb. lots	Lb.	1.00— 1.20
Alcohol, acetone, bbls. or over	Gal.	.. — 2.90
Alcohol, acetone, lesser amounts	Gal.	.. — 3.10
Alcohol, pure, bbl., 65% O.P.	Gal.	.. —12.50
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 2.50
Alcohol, wood, 95%, half bbl. lots	Gal.	.. — 2.60
Alcohol, wood, 95%, lesser amounts	Gal.	.. — 2.75
Alcohol, wood, 97%, bbls.	Gal.	.. — 2.60
Alcohol, wood, 97%, half bbl. lots.	Gal.	.. — 2.70
Alcohol, wood, 97%, lesser amounts	Gal.	.. — 2.85
Amyl acetate, technical	Gal.	4.75— 5.25
Amyl acetate, pure	Gal.	5.75— 6.25
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — 1.25
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 1.80
Carbolic Acid, white crystals	Lb.	.. — .30
Chloroform	Lb.	.55— .75
Citric Acid, domestic, crystals	Lb.	.. — 1.35
Coumarin	Lb.	.. — 6.00
Cream Tartar, 98%	Lb.	.. — .65
Dextrine	Lb.	.. — .09
Ether, Sulphuric	Lb.	..35— .80
Formaldehyde, bbls. or over	Lb.	.. —.35¾
Formaldehyde, 200-lb. kegs	Lb.	.. —.38¾
Formaldehyde, 100-lb. kegs	Lb.	.. —.39¾
Formaldehyde, 50-lb. kegs	Lb.	.. — .41
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Gallic Acid	Lb.	1.25— 1.75
Glycerine, drum, C.P.	Lb.	.. — .32
Hexamethylenetetramine		2.60— 2.80
Oxalic Acid	Lb.	.. — .40
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.50
Phenolphthalein	Lb.	.. — 2.10
Pyrogallic Acid	Lb.	3.00— 3.50
Quinine	Oz.	1.00— 1.10
Saccharin	Lb.	4.50— 5.00
Salicylic Acid	Lb.	.65— .75
Stearic Acid, Double Pressed	Lb.	.28— .33
Stearic Acid, Triple Pressed	Lb.	.30— .35
Tartaric Acid, crystals or powdered	Lb.	.90— 1.00

Rubber.

Crude.

Para, upriver	Lb.	.20½— .21
Caucho Ball, upriver	Lb.	.. —.15½

Plantation Rubber.

1st Latex Crepe	Lb.	.. —.19½
Smoked Sheet	Lb.	.. —.17½

Scrap Rubber.

Boots and shoes	Lb.	.04— .05
Automobile tires	Lb.	.. — .01
Steam and fire hose	Lb.	.. —.01¼
Inner tubes, No. 1	Lb.	.. — .09
Inner tubes, No. 2	Lb.	.. — .06

Tanning Materials.

Archill, extract	Lb.	.. — .35
Fustic Crystals, extract	Lb.	.17½—.22½
Hematine Crystals, extract	Lb.	.39— .42
Logwood Crystals, extract	Lb.	.39— .42
Quercitron, extract	Lb.	.. — .12
Sumac, extract	Lb.	.. — .10
Sumac extract liquid, dark	Lb.	.. — .08
Sumac, extract liquid, colorless	Lb.	.. —.17¼
Sumac, powdered	Lb.	.31— .35
Tannic Acid, commercial	Lb.	.75— .80

Metals.

Aluminium, No. 1, 98-99%	Lb.	.. —.35½
Antimony	Lb.	.. — .09
Brass, yellow ingots	Lb.	.. — .17
Brass, red	Lb.	.. — .20
Cobalt, metal	Lb.	.. — 2.50
Cobalt Oxide, grey	Lb.	.. — 1.70
Copper, casting	Lb.	.. —.18½
Copper, electrolytic	Lb.	.. —.19½
Copper, electrolytic, in car lots	100 Lb.	.. — .19
Gold, Pure	Oz.	.. —45.00
Iron, Pigs	Ton	.. —60.00
Lead	Lb.	.. —.09½
Lead, in car lots	Lb.	.. — .09
Magnesium	Lb.	1.75— 2.25
Mercury	Lb.	.. — 2.50
Nickel, shot or ingot	Lb.	.. — .40
Platinum, pure	Oz.	..—105.00
Silver, bar	Per Troy Oz.	.. — .99
Spelter	Lb.	.. —.10½
Spelter, in car lots	Lb.	.. — .10
Steel, mild, ¼ inch, base price	Cwt.	.. — 5.75
Steel, mild, 3/16 inch, base price	Cwt.	.. — 6.25
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	8.15— 8.50
Tin	Lb.	.. — .47
Zinc, sheets	Lb.	.. — .25

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .42
Motor Gasoline (service stations)	Gal.	.. — .45
Lighting Gasoline	Gal.	.. — .47
Naphtha	Gal.	.. — .41
Coal Oil	Gal.	.. —.29½
Fuel Oil	Gal.	.. — .17
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 3.50
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 6.10
Crude Creosote Oil	Bbl.	16.00—18.00
Refined Creosote Oil	Bbl.	20.00—22.00
Crude Coal Tar	Bbl.	.. — 7.25
Refined Coal Tar	Bbl.	.. — 8.50
Coal Tar Pitch, in Bbls.	Ton	.. —24.00
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52—. 57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .12
Naphthalin Balls	Lb.	.. — .18
Alpha-Naphthylamin	Lb.	.45— .50

Flotation Oils and Naval Stores.

Spirits of Turpentine, in bbl. lots	(Imp.) Gal.	.. — 1.40
Rosin, Grade G, in 280 bbl. lots		.. —14.50
Rosin, Grade W.W., in 280 bbl. lots		.. —15.00

Gums and Vegetable Oils.

Vegetable Oils—

Anise Oil	Lb.	2.10— 2.25
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .28
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .30
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.30— .32
Linseed Oil, raw, in bbl. lots	(Imp.) Gal.	.. — 1.10
Linseed Oil, boiled, in bbl. lots	(Imp.) Gal.	.. — 1.13
Monopole Oil	Lb.	.. — .30

Gums—

Indian, No. 1A	Lb.	.. — .44
Indian, No. 1	Lb.	.. — .42
Tragacanth, No. 1, Ribbon	Lb.	.. — 5.00
Tragacanth, No. 1, Flake	Lb.	.. — 4.00
Tragacanth, Turkey	Lb.	.. — 4.25
Arabic, clear amber sorts	Lb.	.. — .18
Arabic, regular grain No. 4 and No. 6	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22¼
Arabic, white sorts	Lb.	.. — .40
Arabic, powdered, No. 1	Lb.	.. — .25
Arabic, powdered, No. 2	Lb.	.. — .24

Fertilizer Materials

Steamed Bone Meal	Per Ton	70.00—75.00
Pure Ground Blood, per unit of Ammonia		.. — 8.00
Animal Tankage, per unit of Ammonia		7.00— 7.50
Animal Tankage, per unit of Bone Phosphate of lime		.. — .10

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P. F. McCLEARY, Associate Editor. T. LINSEY CROSSLEY, Editor. L. E. WESTMAN, Business Manager.

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EDITORIALS

TWO SOLUTIONS FOR NATIONAL FINANCE

SIR EDMUND WALKER, whose annual review of industrial affairs is anticipated by the public, recently pointed out in a Bank Statement, the important lines which we must follow if we are to make stable our industrial and financial condition.

Following a most comprehensive summary of factors entering into recent business trends, he offers two general solutions or lines of policy for Canada's future. One of these relates to the obvious necessity of re-establishing the value of Canadian money in the United States. This can only be accomplished by increasing our exports and diminishing our imports. When "made in Canada" goods are available, it becomes a national crime to weaken our credit by importations. This solution is of course widely recognized, but his second suggestion is one which has not as yet been fully appreciated. We believe that he has touched upon the root of the whole situation when he referred to the imperative need of industrial research work. In particular he referred to iron and coal and the general chemical industries.

We take the liberty of quoting a paragraph from his address as reported:—

"We pay away yearly vast sums for imports, many of which should be unnecessary. We have untouched stores of raw material for many kinds of manufacturing, the non-use of which is even more serious to Canada from the point of view of national finance than unploughed land. We export food by which our foreign debts are partly paid, but we import what we should make ourselves, and thus create foreign debt. The present high rate of exchange on New York is the concrete expression of this debt, not only of that being created to-day, but in the form of annual interest payments, of all the foreign debt we have created in the past. We have iron ores in plenty but we do not spend enough on research to ascertain their status in relation to other ores in the United States on which we steadily depend. We have about 15% of the coal areas of the world, so far as such areas are accurately known. It may be that science cannot remove impurities and reassemble the coal so as to make transportation charges possible, and thus relieve Ontario of its great drawback, and the nation of its vast expenditure for the importation of this article, but research should be persistent until we are assured that such is the case. We have lately developed manufacturing processes in which chemistry is the main feature and others dependent on cheap water-power, and through these the triple benefit comes to us of giving employment, of enlarging the market for those who sell food and the other necessaries of life, and of offsetting, or lessening by the selling value of the home-created product, the cost of those imports which are the main cause of our present difficulties. We are very glad indeed that our Dominion and Provincial Governments all spend large sums of money in educational and other ways, to aid agriculture. The Dominion Government and some of the provinces also do something in the way of research for other industries, but we have come to a juncture where, along with the ordinary desire for progress, comes the heavy pressure of national debt which can only be relieved by increased production. For this we need research in countless directions, and in addition to what is now being done, I hope liberal aid will be given to all our universities and that the scope of our Government research work may be enlarged."

The solution then seems simple—just plain work, saving and research; and it is the business of Canadian chemists to demonstrate in a concrete way, the significance of "research" in our industrial progress. From the viewpoint of the chemist the word "research" has gradually taken on a significance not yet quite clear to the popular mind. There is a sort of glory attached to a discovery especially if it is of a startling nature, which is not connected with the process of arriving at new facts by a series of extended and related experiments, the plan of which is comprehensive, but the execution of each part of which calls for nothing more than conscientious careful work.

Perhaps in time this interest in industrial research on the part of banks may result in their employing properly trained chemists to assist them in their financial deliberations, as well as advising that they be used to stimulate and control production.

AMMONIUM AND AGRICULTURISTS.

OUR English contemporary, "The Chemical Age," speaking of the knowledge of nitrogen materials being on the increase among farmers speaks of the surprise experienced by one of its representatives when in conversation "with an obvious agriculturist" to find how much he knew of fertilizers and their value.

We wonder if it is more polite to refer to "an obvious agriculturist" than to say "he looked like a Rube." This obvious agriculturist was able

to discourse on nitrogen content and synthetic urea, and the representative was "particularly surprised."

In an excellent article in the January "Harper's" W. L. George the novelist writing on the "Middle West" commented on the enormous amounts of food materials grown, but found the yield per acre very much lower than that prevailing in Europe owing to pioneering conditions still maintaining. We in Canada are not free from the likelihood of aspersions of a similar nature.

For many years one of our best nitrogenous and phosphatic materials has been exported in part in the case of tankage, the dried, ground waste of the packing house: and we have been importing fertilizers from outside but in much lower ratio. Our exports of ammonium sulphate have been considerable also.

Thus, we have exported our bacon, salt pork, beef, our wheat, flour, and cereals and the accusation of mining the soil has been well grounded. We are treating our soil much as we have treated our forests.

We have been to that extent recreant to our trust for posterity. Let our obvious agriculturists take note.

While we are on this question, we have recently noted the use of special grades of tankage in hog feed. This grade of tankage is free from nearly all of the objectionable matters in the tankage produced for fertilizer use. It shows a marked step in progression that much that used to go into the ground, then into the grain, and then into the hog is now available for direct feeding. Thus can the hog eliminate the middleman.

THOMAS EDISON ON THINKING.

WHAT Thomas Edison has to say about chemists in particular, and a number of other people in general, according to a recent issue of the "American Magazine", is something that all chemists should ponder over. The great inventor is not sparing, and if the cap fits, by all means let us realize the truth as he sees it.

Listen to this—

"The more experience I have with young men, the more I am inclined to think that something serious is wrong with both our common-school and our college systems of education. The boys and young men are taught a lot of theories which they seem to learn by rote. At any rate, very few of them are taught to do any thinking of their own. I can very rarely find even a college graduate who can think to any purpose.

"I had a recent experience which proves how true—and tragic—this is. I advertised for industrial chemists. The advertisement explained clearly what I wanted: industrial chemists with experience in managing small chemical works making a diversity of chemicals. Thirty-six applications came. I had personally written out a questionnaire containing forty-eight questions. These questions were all exceedingly simple. If these applicants had had the experience which the advertisement called for they could have answered every one of the questions readily. But would you believe that out of the thirty-six at least thirty couldn't answer even ten of the questions? Yet these young men had good recommendations, and many of them had worked for big concerns.

"The trouble was that they had never done any thinking. Eighty-five per cent of them gave a formula for one thing which doesn't exist! I got only one man out of the lot who was worth engaging.

"It is the same way with many mechanical engineers. They are not mechanical engineers at all. They are utterly incompetent. Yet every large concern is employing many of these incompetents, causing loss to the companies—and, therefore, to the public—of untold millions. If concerns would only get up a little questionnaire and have candidates for positions take this test, at least the worst of the incompetents would be prevented from being put into positions where their gross inability results in incalculable loss.

"How badly this country needs competent industrial chemists, engineers, electricians, and other men of scientific training! It needs these men more to-day than ever before, because the opportunities to raise America's place among the industrial nations of the world are greater now than ever before. The world-wide dislocation caused by the war has opened innumerable new doors for Americans. We have a chance to do a lot of things which were formerly done by Germany. Almost any salary would be gladly paid by chemical companies, electric companies, steel companies, automobile companies, rubber companies, and concerns like Eastman Kodak and the DuPonts for brainy, thoroughly-trained men capable of thinking up improved processes.

"And how easy it would really be for men to qualify for such places. It would take only a little study, only a little earnest, sustained, concentrated thinking. It wouldn't be hard.

"Many men holding executive positions have this same aversion from thinking.

"The man who is of the stuff that makes a big executive usually tackles the hardest things first. He does not necessarily decide an important matter right away. He either takes the papers home with him or carries the substance of the matter in his mind, thinks it all over from every angle, and then is in a position to dictate his decision the following morning. Such men may APPEAR to decide things quickly; and, in a sense, they do decide quickly; but the decision does not come until they have thought the thing out.

"Thinking, after a while, becomes the most pleasurable thing in the world. Give me a satchel and a fishing rod, and I could hie myself off and keep busy at thinking forever. I don't need anybody to amuse me. It is the same way with my friends John Burroughs, the naturalist, and Henry Ford, who is a natural-born mechanic. We can derive the most satisfying kind of joy from thinking and thinking and thinking."

There are a lot of people wondering about those qualities of mind which mark the great from the rest of us. Our educational system is receiving rude shocks both in England and America. It is a real strain on a great mind to catch visions of what could be done in any of our countries, and then of necessity come down to the puddling mental capacity of many of the instruments available. At the same time we believe that there is more real thinking going on in our industrial

plants than Mr. Edison would seem to allow for. There will ever be a clash between our industrial and educational systems until it is better understood that no educational system can hope to turn out individuals who will immediately, and in every instance, double the dividend of the industrial organization. Industries must recognize that they also train and do most of the weeding out. In a university graduate industry still hopes to get something for nothing, and if they would do some reasoning, as well as thinking, they would not be so annoyed.

QUALITY FIRST.

THERE still remains an industrial war residue—namely the desire to do everything on a large scale, or not at all. As we gradually unwind from our tense and false industrial situation, as profiteering becomes normal, and the cost of living and life itself slows down to a reasonable level, we may again become interested in "good work."

There are still people who have the view that a chemist's function is to help them "get by" with inferior goods, or sail "closer to the wind."

WHAT THE WORLD OWES.

"THE world owes me a living" says the radical, and he's wrong. If he cries "The world owes me the opportunity to make a living," he's right.

We have enunciated this highly original proposition to preface a few observations.

The opportunity to make a living first of all involves the requirement of decent initiation into this lachrymal valley. The right to be well born is admitted, why should it not be secured. The rights of parenthood must be considered in due relation to the rights of citizenship. The fact of parenthood entails an obligation of parents to the state and of the state to parents, which is becoming more definitely effective by degrees.

A childhood free from oppression and disease, with access to trees, flowers and nature, with games and the joyful acquisition of knowledge: these are the preliminaries. With these, the consolation and balance of a hopeful religion, and the inspiration of ambition, it is possible for the child to become adult and adorn his citizenship with the noble and worthy practice of some gainful occupation in spite of any obstacles. But why the obstacles? Why loss to community progress, that is entailed in the time consuming struggle of the child without means or influential friends?

Why the handicap in the accident of geography? Has the state no responsibility to equalize the opportunities of children in remote districts whose parents form the first line in the nation's fight for food, with those of children born to city life with its well planned parks, free schools near home, its churches, art, music and universities?

The rural child has some advantage in proximity to the beautiful things of God, but there is a great lack, which should not be. The country is the best place for city life. That suggests an alluring digression, but the point we are working to is that the handicap now attaching to university education be removed, firstly: by making marticulation more generally possible in rural schools, by increasing equipment and the remuneration of qualified teachers. Secondly: by remitting university fees, and thirdly by providing adequate accommodation at cost for the out-of-town student. These would not be an expense, but an investment and they are quite within our means. All that is required is courage, vision and the popular demand, which would come from a realization of this national debt of honor.

OUR STUDENT READERS.

IT is always a pleasure and a sense of satisfaction to the editorial department of this paper to know that a very large number of students in chemistry at our universities and elsewhere are regular readers. In preparing the material for the paper this is kept in mind. A supplementary reading course is never amiss, and a knowledge of business will tend to round out the training of a student. Some students do not realize the value of common every day items of industrial interest. We have known graduates in chemistry who did not have any proper conception of the chemical industries of Canada as a whole or the statistics relating to them. One may know much about the production of sulphuric acid without knowing anything about its industrial distribution. The day has gone when chemists should concern themselves only with a narrow chemical viewpoint. Our future graduates would be better business men and broader thinkers along economic lines if they would follow their products beyond the laboratory and factory stage. To this end a study of Canadian resources, the social end of chemical life in Canada, and a constant keeping in touch with news and business as well as new research work, seems to be having a larger place in the vision of the modern student in chemistry. This paper is anxious to keep Canadian graduates in Canada and find suitable work for them to do, and we believe a thorough knowledge of the Canadian outlook is essential to their success.

"The Chemist and the Crude Factory" in the Hardwood Distillation Industry

The Work of the Chemist or Chemical Engineer in Control of Operations—Analytical Methods Used and an Outline of Research Work Necessary

By R. E. GILMORE

The following paper was delivered in conjunction with a symposium on "Hardwood Distillation" given on November 19th, 1920, before the Montreal Section of the Society of Chemical Industry. Other addresses were given by Mr. D. Gilmour, President of the Standard Chemical Company, and Mr. J. A. Wales, chemist. Mr. D. Gilmour gave a general survey of the industry, and Mr. Wales spoke on refinery practice.

As mentioned by the former speaker the hardwood distillation industry of Canada has resolved itself into the maintainance of outlying crude factories with a central refinery. The name "Crude Factory" does not necessarily mean that the factory is crude, but, that it is a factory producing crude products to be worked up at the central refinery. The number of crude factories in Canada at present is twelve, eight in Ontario and four in Quebec. The total capacity of these is over 500 cords per day with 84 cords as the maximum for a factory and 24 cords the minimum.

It would be necessary to go into the history of the industry to explain the location of the crude factories. In general it is assumed that it has been more economical for the crude factory to follow the wood supply than to bring the wood to a central factory. As you all know the hardwood distillation industry is by no means a new industry in Canada and in compaiison with other industries such as lumber, pulp and paper, etc., is quite small. A system of economical technical control for factories in outlying districts is difficult. The lack of standardization of equipment is a big factor in the efficient working of these crude factories. In the past the policy seems to have been to increase the cordage input of the plant with emphasis on the greater production of the main crude products. The policy for the future is apparently to make the most of the products of a cord of wood with special attention, first to maximum efficiency at every stage and second to valuable bye-products which in the past have been either discarded or burned as fuel. Here then is where the engineer; chemical, mechanical or civil and his unshakable friend, the chemist, makes his appearance.

The Position of the Chemist.

By this term is also meant the chemical engineer, and if you will allow, the engineering chemist. Within the past year the management of the hardwood distillation industry in Canada has proceeded to organize and try out a system of chemical control. By means of engineers and chemists attached to divisional headquarters working in closest co-operation with a central chemical laboratory a much larger degree of chemical control is being tried out at the crude factories than has been the practice in the past. The following sayings which may be found in or out of the chemical literature are worth while repreating here to enable you all to appreciate the joys and tribulations of a chemist in the hardwood distillation game.

"The chemist is the official goat around the plant on which to register all kicks and complaints."

"Chemists certainly are a bunch of scrappers, are they not?"

"With 30 years' experience in this work it is preposterous for you young chemists to even think that you can learn all our secrets in so short a time."

"Chemical engineering sometimes consists of the study of freight rates."

"The production of wood alcohol and acetate has reached a state where more cannot be economically produced from a cord of wood."

"German statistics claim that but one of 15 serious trials of new chemical processes are successful, but that this percentage amply pays for the losses entailed in 14 unsuccessful ones."

With the above brief introduction I will proceed to describe some details of the crude factory operations. To go into the full detailed description of the whole crude factory practice is not the purpose of this paper. I merely wish to mention the particular operations where chemical control is useful and essential. For a full description of the crude factory practice may I refer you to a worthy paper viz., "The Hardwood Distillation Industry in America" as given by French & Withrow in the January number, page 47, of the "Journal of Industrial and Engineering Chemistry."

Raw Materials and Crude Products.

As in the past the raw material consists mainly of maple, birch and beech with small quantities of oak, iron wood, etc. The question is often asked; why use such perfectly good lumber material as maple, birch or even beech for destructive distillation. The bulk of the cordwood, however, as now supplied from the outlying districts I am afraid would not be considered by lumber men to have been by any means excellent material for any other purpose than for carbonization or firewood.

The bye-products of the past are now among the main products. Wood alcohol, charcoal and acetate of lime are at present the main products the importance of which come in the order given. Different grades of creosote oils, acetone, and ketone oils along with sodium acetate are the main crude factory bye-products.

Crude Factory Outlay.

The general outlay of a crude factory consists of the following: (1) Hardwood storage yard with its railway trucks; (2) Iron buggies each holding two cords; (3) boiler house and its coal supply; (4) oven house proper where the wood is carbonized; (5) still house where the condensible liquor from the ovens is worked up into crude alcohol and acetate of lime liquor; (6) lime storage; (7) acetate of lime storage; (8) charcoal coolers and; (9) charcoal sheds from where the charcoal is shipped in box cars.

Process Flowsheet—The flowsheet herewith is a general diagram of the process carried out at the crude factories with special attention to the wood oils. These are now becoming important, ranking third in value among the crude products.

Crude Factory Operations and Their Technical Control.

The general scheme of the engineering operations carried out at a crude factory as given by James R. Withrow in one of his papers to the American Chemical Society (see Journal of Industrial and Engineering Chemistry, vol. 7, page 912) may be repeated here. He divides the operations into three main groups as follows:

1. Preliminary handling of the cordwood raw material.
2. Destructive distillation or carbonization proper.
3. Treatment of the pyroligneous acid liquor distillate.

A large proportion of the engineering operations are of a mechanical nature rather than chemical. There are, however, many opportunities for the chemical engineer to apply his scientific knowledge. The application of this knowledge, however, should be made with an open mind and tempered with a large measure of good common sense.

The engineering operations themselves may be discussed under

the following heads and sub-heads, somewhat similar to Withrow's.

1. Preliminary Handling of the Woods.
   - (a) Cutting and splitting of the cordwood.
   - (b) Seasoning, transportation and storage.
2. Destructive Distillation (profer).
   - (a) Loading the oven cars.
   - (b) Charging and sealing the ovens.
   - (c) Oven firing.
   - (d) Condensation of distillate and fuel gas recovery.
   - (e) Pulling the cars of alcohol from the ovens.
   - (f) Charcoal coolers.
   - (g) Charcoal disposal.

The above operations are mostly mechanical but in many, chemical engineering research is needed.

Hardwood cordwood is a very variable raw material. Not only does the yield of products vary with the different species, but wood from different parts of the country will give different yields. Cordwood with ten months to a year seasoning is considered (in Canada) the best practise. Green wood, properly seasoned wood, and old wood all give different results and further, wood cut in the fall or winter may give differentre sults from wood cut in the spring or summer. Among the problems for the research engineering chemist are the following:

(a) Proper time to cut the wood.

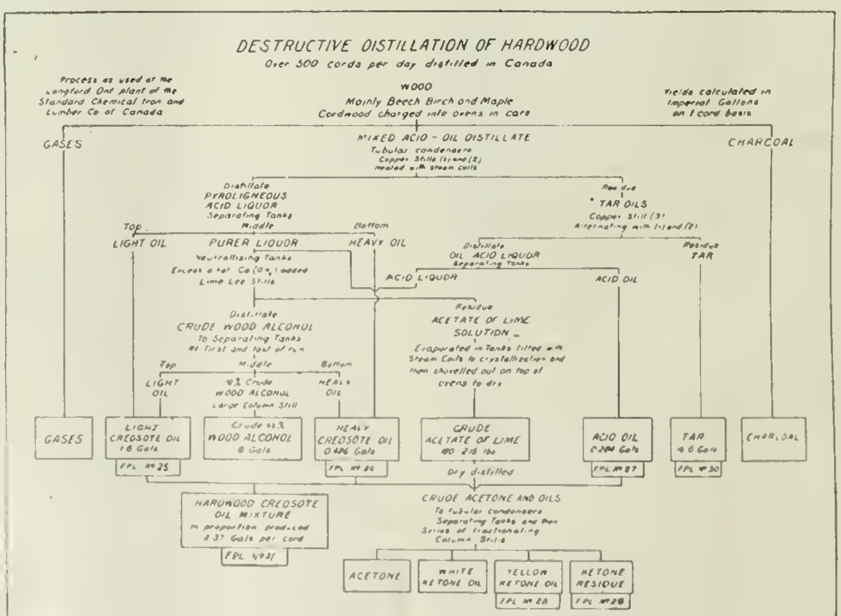
(b) The proper seasoning for maximum yields.

(c) The maximum yields possible from wood known to be poor or bad.

In the destructive distillation proper, two operations namely, oven firing and fuel gas recovery are all important from the chemical engineering standpoint. Theses have been written and may still be written on proper oven firing to give the best temperature control and consequent maximum yields. This temperature control must take place as the temperature within the oven approaches or has just reached the exothermic decomposition point of wood, namely 280-290° C. This exothermic reaction is distinctly noticed in normal or dry wood, say carrying up to 20 or 25% moisture but with 40 to 50% moisture wood the exothermic point is hardly noticeable in the large commercial ovens. A great deal has been published on this subject and all interested should consult the chemical literature especially the publications by R. C. Palmer of U. S. Forest Products Laboratories, Madison, Wisconsin.

The temperature control of the ovens is watched by means of pyrometers or rather recording gas thermometers placed in the oven exit pipe between the back of the oven and the condenser. The pyrometer registers only the temperature of the exit gases. In the commercial practice the relation of the temperature of the exit gases thus measured and of the temperature of the separate sticks of cordwood within the oven is as yet unknown and, just here, comes the difficulty of applying temperature control results, obtained by laboratory or semi-commercial experiments, to the commercial scale. For normal wood there is reason to believe that there is (say at the middle of the run) a 50 to 70° C difference between the temperature of an individual stick of wood within the oven and that of the exit gases. This difference of temperature varies of course at different stages of the run and will vary not only with different moisture contents but with the rate at which the whole charge is brought to the exothermic point, in other words with the speed of the reaction before and after the critical stage. If then complete reliance is to be put on the pyrometer in order to indicate the temperatures at which the reactions within the oven are taking place all these variables need to be known. Temperature control generally means the slowing down of the reaction at the "breaking point", when gas and tar begin to come. The time required to reach this breaking point and then the rate of flow of the distillate can be noted. By means of this information along with the pryometer chart the proper oven firing control can be determined. The value of the products required, also enter into the question of proper oven practise. The oven practise for maximum yields of alcohol does not necessarily mean the best oven practice for acetic acid and charcoal and as is apparant from the above, dry and over seasoned wood requires a different oven practise from normal or green wood. Once then the operator gets away from normal and properly seasoned wood, trouble is to be expected and it is here that the chemical research department should be of use not only in checking up the maximum yields possible from material at hand but to assist in determining the proper oven practise to follow to obtain these maximum yields commercially.

The uncondensable gases from the ovens either go back to be burned under the ovens or to the boilers. Up to the present no great efforts have been taken to scrub out the last traces of alcohol from these gases. Enough data, however, is now at hand to indicate that simple inexpensive scrubbers can be used



Flow Sheet of Hardwood Distillation Process.

for this purpose by means of which the yield of alcohol, acid, and creosote oils can be materially increased.

Treatment of the Pyroligneous Acid Distillate.

1. Settling of the raw oven liquor (by gravity settling-tanks).
2. Distillation of liquor in copper stills.
3. Distillation and steaming of the settler tar and tar residues in copper stills.
4. Separation of oils in copper still distillate.
5. Neutralization of copper still liquor with slaked lime.
6. Distillation of neutralized liquor in the "lime-lee" still.
7. Evaporation and drying of neutralized liquor to obtain 80% calcium acetate as products for shipment.
8. Re distillation of the "lime-lee" alcohol acetone in a rectifying (80%) still to obtain crude alcohol for shipment.

In working up of the pyroligneous acid distillate the control work necessary is mostly mechanical. The operation of the stills: namely the copper still; to free the settled oven liquor from tar and oils; the lime lee still, where the alcohol is distilled off from the neutralized liquor; and the 80% alcohol still where the alcohol is brought from approximately 10% up to over 90% strength; are all mainly mechanical. Specific gravity determinations of the distillate at different stages, tells the operator what is happening. The filtering of the acetate liquor and the washing of the resulting sludge, the evaporation of the acetate liquor of from 10 to 15% strength down to the proper crystallizing stage and then the drying of the acetate of lime on top of the ovens are also mainly mechanical. The neutralizing of the copper still liquor demands, however, careful chemical control. Although the degree of neutralization is generally determined by the non-technical operator by titration as a check on the observed color changes at the neutral or slightly alkaline point, the normality of the 20th normal acid solution used, must be kept accurate by the chemist, by whom also the still man's titration results should be checked.

Of late years since the alcohol is the most important product, the efficiency of all these operations in respect to alcohol yield has been and is of great importance. To be able to tell the alcohol content of the oven liquor as a check on the oven practice and of the liquors at all stages up to the time it is ready for shipment is one of the most important duties of the chemist. For this purpose laboratory fractional distillation apparatus operated by a chemist is necessary; at least until an efficient standard method is established and put in practice.

The grade of crude wood alcohol from the different crude factories is quite variable. This is due not only to variable raw material but also to lack of standardization of apparatus used. In the final 80% still operation many factors such as the strength of the lime lee alcohol stock, the chemical treatment of this stock, the rate at which the machine is run and the washing and handling of heads and tails "oils", all influence the grade of alcohol obtained. All the crude alcohol goes to the central refinery where it is finally chemically treated to get rid of the esters, aldehydes, ammonia compounds, oils, etc., during the intermediate and final rectification operations.

Laboratory Analytical Work.

Samples of the crude factory finished products are shipped to the central laboratory for analysis while process samples are taken care of by the divisional chemist or his representative at the crude factory. Either the superintendent or the divisional chemist is responsible for the sampling, which is, as you know, practically as important as the analysis itself.

In the following description of the analytical work no attempt is made to compare the different possible methods, merely the methods now used are given.

(I) Crude Wood Alcohol: This product is examined for (a) Total solvents calculated as methyl alcohol, from the specific gravity. (b) Ketone alcohol content calculated as acetone and (c) ester content calculated as methyl acetate.

The specific gravity reading at 15.5° C is determined either by a Wesphal balance or hydrométer and the per cent. vol of wood alcohol is read from a sp. gr. table. As just mentioned, the term "Wood Alcohol" here means total solvents other than water, and includes not only acetone and methyl acetate but any wood oils not removed by the 80% column still at the factory. Strange to say the alcohol sp. gr. tables in general use are those for ethyl or grain alcohol. It is interesting to note that could the methyl alcohol tables be used here, a gain of about 0.7% volume would result. The determination however, of the alcohol content by means of the specific gravity is so crude that it makes little difference from the scientific standpoint which tables are used.

Miscibility—By this term is meant the miscibility of the alcohol sample with water. The proportion of one part of alcohol to two parts of water is used. Oil impurities in the alcohol will cause a milkiness or immiscibility. A sample giving a dense milkiness when mixed with twice its volume of cold water is termed bad as to miscibility. A less denseness is called poor. A faint turbidity will denote "fair" and lastly a resulting clear solution is reported as O.K. or good.

The Ketone Content—is determined by Messengers' test, where from a known amount of iodine—KI alklaine solution, iodoform is formed and the excess iodine titrated against standard thiosulphate solution. The ketones are calculated as acetone and reported as grams in 100 cc.

The Ester Content is determined by ordinary saponification method and calculated as methyl acetate. It is also reported as grams in 100 cc. The crude alcohol shipped from the crude factories averages between 90 and 95% vol. with the acetone content varying from 8 to 15% and the methyl acetate from 0.0% to 5%.

(2) Calcium Acetate—This product which is generally known as gray acetate of lime is examined for moisture and acetic acid content. By means of a factor the calcium acetate is calculated and is reported as % by wt. on both the wet and dry basis. Acetate of lime is sold on the "as received" or wet basis and is required to analyze not less than 80% calcium acetate.

For analysis a 3-gram sample is weighed into a long-neck Kjeldahl flask. 15 cc. of 70% phosphoric acid and about 100 cc. of water are added and the mixture distilled in an ordinary Kjeldahl nitrogen apparatus; keeping a constant volume in the flask as the distillation proceeds. The acetic acid distillate is collected and titrated against standard alkali solution using phenolphthalein as indicator. For a detailed description of this analysis and alternative methods see Allen Commercial Organic Analysis, Vol. 1.

Other materials sent in from the crude factories and analyzed at the central laboratory are coal and ash samples. By a proximate analysis of these, a check is kept on the grade of coal used and the amount of combustible matter left unburnt in the ashes dumped.

Process Samples.

As mentioned above the chemical examinations of most of the process samples are made at the factory. Some of these are as follows:

(a) Moisture content of the wood used.

(b) Moisture content of the acetate on the drying floor.

(c) Moisture content of the charcoal for shipment.

(d) Strength of last acid liquor and alcohol runnings from the copper stills.

(e) Degree of neutralization in the neutralizing tube.

(f) Alcohol strength of the lime lee liquor at different periods of a distilling run.

(g) Alcohol strength of the distillate from the 80% still at different stages.

Oven Liquor Analysis.

In the ordinary running of the crude factory the yields of alcohol and acid per cord of wood carbonized is not known until the finished products are ready for shipment. By getting a reliable sample either of the oven liquor as it comes from the goose necks at the bottom the oven condensers or of the distilled pyroligneous acid as it goes to the neutralizing tubs and submitting this to analysis, the efficiency of the neutralization and consequent refining can be ascertained. For this a rapid and reliable method for oven liquor analysis is necessary.

The following method has been worked out in our central laboratory and found to be quite rapid and to give reliable results. (a) For alcohol content 500 cc. or better a litre sample of the oven liquor is slightly over-neutralized with concentrated NaOH solution and given a preliminary distillation through a Hempel bead column and the distillate condensed in a Graham spiral condenser. This distillate the last fraction of which registers a sp. gr. of 1000 or over is transferred to a second Hempel bead column which has been fitted with a constant temperature reflux such as used in the Bureau of Standards, Washington, D.C., a description of which was published by F. M. Washburn in the January number of the Journal of Industrial and Engineering Chemistry, page 73. Instead of a worm-constant-temperature-reflux we use a metal Soxhlet ball condenser the temperature of which is regulated by the flow of condenser water allowed to pass through it.

By means of this reflux Hempel column, alcohol reading 90 to 95% can be obtained from an oven liquor analyzing 4 to 5%. The volume and the sp. gr. of the distillate is taken from which can be calculated the alcohol content of the original oven liquor sample. This method may be shortened by cutting out the first distillation when the final rectification is made from the over-neutralized sample itself. A single rectification without a preliminary distillation however, was found to give constant low results amounting to approximately 2% on an oven liquor running 5% alcohol content.

The above method for analyzing oven liquor for alcohol content is the result of considerable laboratory work of an investigational nature. It is proposed to publish further results at a later date. (b) For the acetate content the most reliable method we have found is to take 100 cc. sample of the original oven liquor and after distilling in an ordinary distillation flask, to get rid of the tar, slightly over-neutralize the distillate with slaked lime and evaporated to dryness in an open vessel on a steam bath. On the dried residue determine the calcium acetate in the usual way and calculate back to the original sample.

Some of the More Important Immediate Research Problems.

Ten out of twelve of the hardwood distillation crude factories in Canada are under the management of a single company, namely the Standard Chemical Co. which gives the central chemical laboratory a chance to carry on extensive research work along with the necessary routine chemical analysis. For this purpose approximately half of the chemical staff at our central laboratory are engaged on special research work and since the present policy is to make the most out of a cord of wood carbonized, research work for at least a year yet, must deal with the main products and bye-products as now produced rather than an over-ambitious search for derivations and new bye-products.

Following is a brief summary of some of the more important immediate research problems.

(1) The Proper Oven or Carbonizing Practice to Follow to Obtain the Maximum Yield of Alcohol from the Material at Hand.—Temperature control in the carbonizing or primary distillation, ever since charcoal ceased to be the main product, has been the most important operation. New factors giving this operation still more importance and on which the research chemist can throw light are: (a) Methyl alcohol is a much more valuable product than acetate acid. (b) Wood that has been cut and stored longer than is usually the practise, is liable to deteriorate in respect to its alcohol yield on carbonizing. (c) The effect of fungi and bacterial disease on wood cut in different seasons and stored for different lengths of time. (d) The maximum content allowable for the economical carbonizing of the wood in the ovens now used. (e) The comparative yields of alcohol, acetone and acetate of lime from different species of hardwood and the best oven practise to obtain the maximum alcohol with a low acetone or ketone content from these.

A large scale laboratory experimental oven holding 15 to 20 lbs of wood has been set up and operated in our research laboratory. With this oven, temperature control experiments have been carried out, the results of which have been quite satisfactory. On completion of these experiments it is our intention to publish the results for the welfare of the hardwood distillation industry in general.

(2) Hardwood Tar and Creosote Oils.—These oils and tar may be drawn off separately at the crude factory and are as follows: light creosote oil, heavy creosote oil, acid oil and hardwood tar.

Considerable work has been done on the creosote oils for use as flotation oils. (See Canadian Wood Oils for Ore Flotation, Canadian Chemical Journal, Jan., 1918.) The market however, for this purpose is small.

A crude creosote oil has already been produced from the Canadian hardwood oils and sold according to the following specifications, viz.: 95% vol. distillable between 175° C and 235° C with 70% soluble in 10% NaOH.

An investigation into the feasibility of producing a semi-refined 100% acidic product has been under way for some time.

Once such a product can be economically produced it is but a short step to be able to put on the market a Canadian made beech wood creosote preparation to be used in the drug trade.

Insecticides.—On request, samples of creosote oils have been supplied to Department of Agriculture, Province of Nova Scotia, for experiments as an insecticide for such as the cabbage maggot. The results of these experiments which are now being waited for will no doubt be of interest.

Hardwood Tar.—Which is now used as fuel at the crude factory should be more valuable for other purposes. The low decomposition point of the tar which is about 350° C makes it an admirable binder or part binder for any briquetted fuel requiring a heat treatment just after briquetting. Other possible uses to which it may be put are as an insulating pitch or even for the manufacture of carbon black.

The feasibility of utilizing the various grades of acid and neutral oils as wood preservations either as impregnators or in the form of brush or dip, shingle stains is also being investigated.

(3) New Uses for Charcoal.—Despite the fact that there is a great demand for bag charcoal for domestic household purposes, new uses for charcoal must be found to make this product, on the whole, either more valuable or more in demand in order to allow the production of the other more valuable products. The following uses suggest themselves and along these lines investigational work is to be directed.

(a) A modified charcoal for filtering and clarifying purposes as a substitute for bone charcoal.

(b) As charcoal briquettes for foot warmers, etc.

(c) As a higher grade product than coke for the manufacture of carborundum.

Before leaving this subject I would like to mention the results of some investigational work on "Methylal" which has been carried out in our research laboratory during this last summer. Methylal as you know is a condensation product of the methyl alcohol and formaldehyde and is obtainable in a high degree of

purity from the heads of the alcohol recoverable in the manufacture of formaldehyde. Repeated fractionations were made on these heads for the purpose of obtaining a sample of methylal as chemically pure as possible on which to study its properties. Results of this work have proved that the figures in the literature as to its specific gravity—boiling point and properties are mostly wrong. As soon as this work is carefully checked a correction of these errors will be offered for publication.

Research Work of an Acedemic as well as of an Industrial Nature.

In the hardwood distillation industry as in many other industries there are chemical research problems that from a purely scientific standpoint have to give way to more important problems, results of which can be interpreted immediately in dollars and cents.

Such a problem is a complete analysis of acetate of lime as produced at the crude factory. It is known that other organic acids such as propionic and butyric are present in appreciable quantities. A short and efficient method for determining small quantities of these acids in the presence of large proportions of acetic acid would be appreciated in the assay of the commercial product. A typical analysis of acetate of lime reads as follows: Moisture, 3.5%; Acetic Acid, 61.5%; Calcium Acetate, A_2S recovered 81.0%; Dry Basis, 84.0%.

Such a report indicates that there are 16% impurities. Besides other organic acids there may be other valuable products such as tannins, etc.

A second problem more acedemic in nature is the chemistry of hardwoods. As yet the writer is aware of no comprehensive work on such as the lignin, cellulose, etc., content of the different hardwoods at different stages of growth, at different periods of ageing after being out and the effect of fungi and bacteria on these. All this information linked up with the yields of valuable products on being carbonized would indeed be interesting and would doubtless be of commercial value.

Still another problem would be a complete organic analysis of crude wood alcohol. According to the literature it contains besides methyl alcohol, innumerable ingredients such as hydrocarbides, crotonylic, amylic and amyl alcohols, ethers, acetals, acetone and higher ketones, formaldehyde and other ingredients known as "oils."

Wood alcohol as you will notice by the daily papers is not very good for the human system. It may, however, be questioned whether chemically pure methyl alcohol has the same poisonous qualities when taken internally. The writer has had described to him certain experiments where rabbits have been fed on increasing doses of columnian spirits mixed with bran until the imbibing animals were taking pure alcohol as their liquid food. The most noticeable physiological effect was that the rabbits became quite drunk but on being again fed on proper food apparently came back to normal health.

Montreal, Nov. 19, 1920.

WORK PROGRESSING ON CHIPPEWA POWER CANAL.

Everything that engineering skill can do is being done to complete the Chippewa Power Canal by September 1st., 1921. The hydraulic dredge "Cyclone," the most powerful dredge of its kind in the world, has been released by the Harbor Commission, Toronto, where it has been engaged day and night during the summer and fall on harbor dredging and will be operated on the gigantic work at Niagara. The big dredge will be used to remove 5,000,000 cubic yards of rock and earth necessary to complete the Chippewa Canal project. The Ontario Hydro-Electric Commission have over 3,500 men working on the canal development, besides a number of the largest electric shovels ever built.

ELECTROLYTIC MANUFACTURE OF CHLORINE

The liquid chlorine factory at Pont-de-Claix, which was established originally to meet the demands of chemical warfare, produces chlorine by the electrolysis of sodium chloride and absorbs a load of about 3,000 kw. obtained from a large power distribution scheme fed principally by water power.

Current is transmitted at 26,000 volts, threee-phase, 50 cycles, over an 8 km. transmission line, and is transformed on the premises down to 1,850 volts to feed motor-generators which give a supply of continuous current at 120-140 volts to the electrolytic cells. Both synchronous and induction motors are employed. As the works are connected to a very large power network fed by a number of stations in parallel, very complete protective apparatus is provided in view of the serious voltage surges which might develop, and a special apparatus is used to throw out the circuit breakers if the frequency should rise to an undue value. The brine to be electrolyzed is prepared by the flow of water through tanks containing salt, with electrically driven agitators, and impurities are removed by filtration. Each of the two electrolyzing rooms contains 34 cells taking about four volts each. Each cell can be cut out of circuit for repairs, etc. Six tons of chlorine are produced in each room per 24 hours. The gas is passed through sulphuric acid dessicators and liquified by compression in electrically-driven turbine pumps. All electrical apparatus is thoroughly protected from the effects of chlorine and enclosed as completely as possible. A portion of the chlorine is passed into chambers, where it is absorbed by lime. Considerable difficulties had to be overcome both with regard to the rapid consumption of the carbon anodes and the corrosion of the pumps by the chlorine unless it is very thoroughly dried. ("L'Industrie Electrique," Nov. 25, 1920.)—From the "Technical Review", London, Eng.

COLOR OF WATER

The following letter appearing in a recent issue of "Chemical News" (London) raises rather an interesting point.

To the Editor of the "Chemical News."

SIR,—Sir W. D. Bancroft, in a recent paper (Chemical News, 1919, cxviii, pp. 197, 208, 222, 233, 248, 254) has discussed the question of the color of water, with regard to the theories that its color under various conditions is due to absorption of light, reflection by suspended particles, influence of dissolved matter, etc., but he has overlooked the aspect of the question raised by Ducleaux and (Mme.) E. W. Wollemann ("Journ. de Physique," 1912, (v), ii., 263). These investigators found that a long column of water appears blue by transmitted light at comparatively low temperatures, but it becames green with rise of temperature, which they explain on the assumption that polymerised water molecules are blue, and the simple ones green, the former being broken up with increasing temperature. Confirmation is afforded to this explanation by the fact that solutions of colourless salts, which must contain less polymerised water molecules than pure water, are greener than pure water at the same temperature.

Of course, the vapor density of steam is much less than that required for the formula H_4O_2, and greater than for the formula H_2O, its density at about 100° C. corresponding with about 91 per cent. of H_2O molecules, whilst more recent work has rendered it necessary to assume the existence of trihydrol (H_6O_3) in addition to dihydrol (H_4O_2) and hydrol (H_2O) in liquid water, in addition to which H. E. Armstrong assumed that two intramolecular forms of each "hydrol" also exist.

If these assumptions be true, then the six different forms of ice discovered by G. Tammann (Zeit. pyhsical Chem., 1910 and 1912) correspond to the six different molecules assumed to exist in liquid water.—I am, &c.,

E. TOMKINSON.

Barrow-in-Furness, December 24, 1920.

RUBBER ENERGY*

Energy Relationships of Vulcanized Rubber----Transformation of High Proof Resilience of Rubber into Energy and Increases in Resilience by admixture of Compounding Ingredients

By WM. B. WEIGAND†

IT is proposed to discuss very briefly and nonmathematically some of the many interesting energy relationships of vulcanized rubber.

Energy Storage Capacity.

In the accompanying table is shown what is known as the "proof resilience" of the chief structural materials. This is defined as the number of foot pounds of energy stored in each pound of the material when it is stretched to its elastic limit. You will observe that tempered spring steel has less than one one-hundredth the resilience of vulcanized rubber, and that even hickory wood, its nearest rival, also shows less than one per cent. of the resilience of rubber.

Table 1.—Proof Resilience.

Material.	Ft. Lbs. per Cu. In.
Gray cast iron	0.373
Extra soft steel	3.07
Rail steel	14.1
Tempered spring steel	95.3
Structural nickel steel	14.7
Rolled aluminum	7.56
Phosphor bronze	4.08
Hickory wood	122.5
Rubber	14,600.00

This property of course is directly made use of in aeroplane shock absorbers, etc., but our present reference to it is made with a view to discussion, first of the character of this stored energy and its transformation into thermal energy of two kinds; and, second, the modification and in fact remarkable increases in energy storage capacity made possible through the admixture of suitable compounding ingredients.

Thermal Effects.

What happens to the mechanical work done on a rubber sample when it is stretched to any given point? Is it in the form of potential energy of strain, as in the case of the steel spring? The answer is, "No." Has it all been irrevocably lost in the form of heat, as when a lump of putty is flattened out? No. Or lastly, as when a perfect gas is isothermally compressed, has the work done on the sample been turned into an equivalent amount of heat which is, however, convertible back into work during retraction? Here again the answer is, "No."

The fact is that rubber has all three properties combined. When you stretch a rubber band, some of the energy is stored as potential energy of strain, exactly as when you stretch a steel spring. Another fraction of the energy input is turned into what may be called reversible heat. You can easily feel this heat on stretching a rubber thread and touching it to your lips. The rest of the energy input or work done on the rubber appears in the form of frictional heat.

Retraction.

We will suppose that the extension was made rapidly (i.e., adiabatically) and consider what happens on the retraction journey, which we will assume to take place rapidly and immediately. First of all, the potential energy of strain will nearly all be returned in the form of useful work, exactly as in the case of the steel spring. Secondly, the reversible heat which on the outward journey acted to increase the temperature of the sample will be re-absorbed, transformed into useful work, and therefore cause no energy loss. Finally, the frictional heat developed during extension will be increased by a further amount on retraction, at the expense of the potential energy of the stretched sample.

Thus, when the rubber has been stretched and allowed to return to substantially its original length, it will differ from its original state only by the total amount of frictional heat developed. By the law of conservation of energy, we can at once say that this frictional heat is exactly represented by the difference between the mechanical energy input and output of our system. This phenomenon is, of course, known as hysteresis, and is exhibited by all structural materials. The fact that in the case of rubber, the energy storage capacity is several hundred times greater than in the case, say, of steel, explains why hysteresis phenomena become relatively of such cardinal importance to rubber technologists.

Reversible Heat and the Joule Effect.

Suppose we extend a rubber sample and allow the reversible heat thus generated to disappear. In other words we stretch it isothermally. We are then dealing with a system substantially in equilibrium. The two factors governing this equilibrium are, first, the load on the rubber, and, second, the thermal condition. Any change in the equilibrium requires a change in these two factors. Conversely, a change in either of these factors will shift the equilibrium. Now one of the fundamental properties of any equilibrium is that when any factor is changed the equilibrium will be shifted in such a way as to offset the change in the factor. Thus if the load is increased, the sample will stretch and become stiffer so as to resist the increased load. Similarly, if the temperature of the sample is increased, the rubber will contract, since in so doing heat is used up and in this way the disturbance minimized.

This contraction on heating was predicted by Lord Kelvin, after Joule had discovered, or rather rediscovered, the development of heat during extension. Metals and most other rigid bodies behave, of course, in a totally different fashion. Instead of generating heat on extension they consume heat, and become cooler, with the result that the application of heat to a stretched metal wire causes it to expand instead of contracting, as in the case of rubber.

The Joule effect has been subjected to many misinterpretations, such, for example, as attributing it to a huge negative temperature coefficient of expansion, which is, of course, incorrect, since rubber has in fact a large positive coefficient. Others have attempted to explain the phenomenon by assuming an increase in Young's modulus. The French investigator, Bouasse, who has done such masterly work on the elastic properties of rubber, disproved this hypothesis, however, and showed in fact that Young's modulus grew smaller with increased temperature.

The writer has not done any experimental work on the reversible heat which governs the Joule effect, but there can be no doubt as to its technical importance. Thus, for example, the internal state of a solid tire tread as well as breaker conditions in large pneumatics is clearly bound up twih the reversible thermal effect as well as with the frictional thermal effect. Every time the tire impacts upon the road surface each part of the rubber stock traverses a stress-strain cycle. Even if we admit that the reversible heat generated during extension is reabsorbed during contraction, we have to consider the gradual building up of internal temperatures due to accumulation of frictional heat. This increase in temperature, acting through

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the Joule effect, will lessen the extensibility of the heated rubber as compared with adjacent regions at lower temperatures, thus setting up strains which doubtless play a role in breaker separation the bane of large-sized pneumatics. It is therefore highly desirable to work out rubber compounds which will develop not only minimum frictional heat, but also minimum reversible heat. Quantitative measurements of the Joule effect with different compounds and different cures would serve as an index to this quantity.

Mechanical Picture of Rubber.

The diagram in Fig. 1, which was first suggested by a former colleague, Dr. F. M. G. Johnston, of McGill, helps clarify one's mental picture of the thermodynamical phenomena associated with rubber strains. Rubber may be viewed as a combination of a cylinder of gas, a steel spring, and a friction member. Following this picture, extension of the rubber is accompanied in the first instance by compression of the gas, thus generating the reversible heat Q_R. In the second place, the steel spring is compressed, thus generating the increase in potential energy of strain E. Lastly, the friction element operates through the extension, generating nonreversible heat Q_F. When the rubber retracts, the gas expands, the spring retracts, and the friction element contributes another increment to the nonreversible heat.

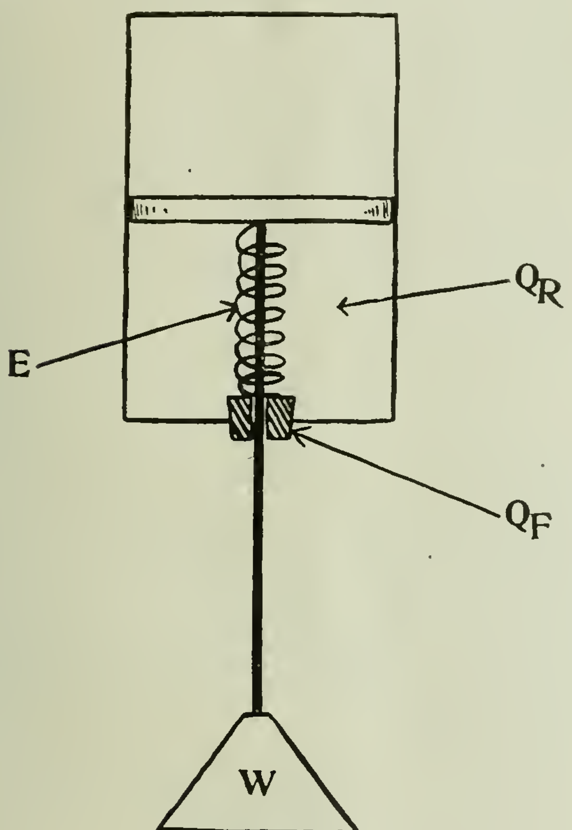


Fig. 1—Mechanical Picture of Rubber

Frictional Heat of Hysteresis.

Suppose now the sample is extended and we apply heat to the system. The gas in the chamber will expand so as to use up heat, raising the weight W, thus shortening the rubber and so constituting the Joule effect.

Although the reversible heat has doubtless a decided technical significance, by far the most important energy transformation is that of useful work into heat through hysteresis, and a short account will now be given of the experiments carried out under the writer's direction by Mr. H. F. Schippel.

Briefly, the method consisted in generating hysteresis loops by graphically recording stress-strain curves of extension and retraction up to varying elongations. By means of the planimeter the area of the hysteresis loop was determined and the readings calculated to foot pounds of energy referred to one cubic inch of rubber. In order to obviate the inertia of dead weight tensile machines, and for other reasons of convenience, a special machine was devised, the principal features of which were the alignment of a helical steel spring with the sample and the use of extremely light and nicely fitting parts. The rubber sample was merely a standard test piece about 0.1 in. in thickness, 0.25 in. wide, and 2 in. between shoulders. The ends of the test piece were secured in special light weight clamps designed practically entirely to obviate creeping. The spring extension measured the stress, and the separation of the clamps, the strains.

Through the use of this special machine, it was possible to generate stress-strain cycles both under rapid, or adiabatic, and slow, or isothermal, conditions.

Isothermal Cycles Adopted—It is of course obvious that the size and character of the hysteresis cycles will depend on whether they are generated adiabatically or isothermally. Under the former conditions, the reversible and frictional heat developed on the extension journey are only slightly dissipated, and so act to increase the stiffness of the sample and alter the trend of the curves. Owing to the difficulties of inertia, it was not found possible to generate adiabatic loops at speeds sufficient to allow of concordant results. The method finally adopted was to generate the cycles at low speeds, for example, 20 in. per minute, or under practically isothermal conditions.

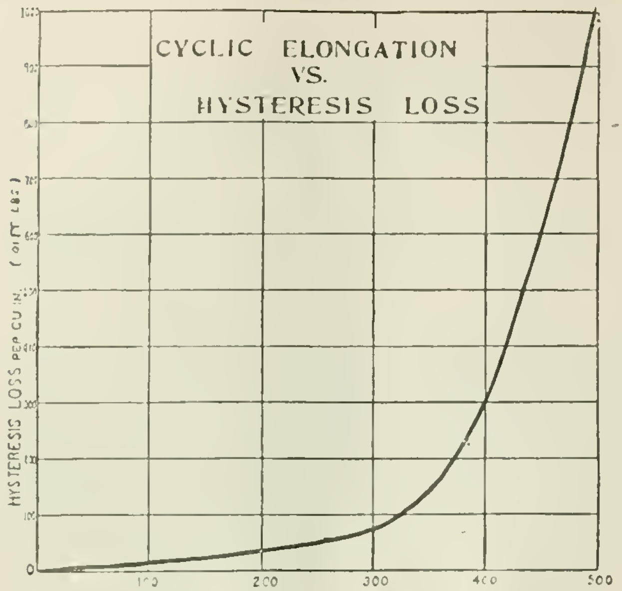
Preliminary Extensions—It is of course well known that the area of the first hysteresis loop is greater than that of the second, and so on. In most cases, however, the third loop differs only very slightly from the succeeding loops, and so in our work when it was the intention to generate the hysteresis loop up to an elongation of 300 per cent., the test piece which had not been otherwise handled after cutting from the molded slab was put through two preliminary cycles up to 300 per cent., and then clamped into the machine and its hysteresis loop graphically recorded. In taking a succession of loops at increasing elongations the same test piece was used and two preliminary loops made at each elongation. The initial length upon which the cycles were based was the length measured after the two preliminary extensions had been made.

Range of Compounds Used—The experimental results included tests on a standard series of factory compounds used in tire construction. They thus included practically pure gum friction compounds, lightly loaded breaker compounds, and more heavily loaded tread stock. These various stocks were mixed in the factory under standard conditions, and given laboratory cures ranging from 50 per cent. of the optimum cure in each case up to cures 275 per cent. over the optimum in some cases.

Hysteresis loops were generated at elongations ranging from 100 to 500 per cent. There is considerable difference in opinion as to whether in measuring hysteresis one should work toward reaching a fixed percentage of the breaking load, irrespective of the elongation, or work to a definite elongation, irrespective of the load required. The latter method seems to the writer the only correct one from the technical standpoint, in view of the fact that the strains incurred for example by the skim coat, breaker, and tread of a pneumatic tire are arbitrarily fixed by the inflation pressure and the load.

Relation between Hysteresis Loss and Cyclic Elongation.

Fig. 2 illustrates the results obtained with a typical pure gum high-grade tire friction with a breaking elongation of upwards of 900 per cent. This particular compound contained 5 lbs. of sulfur to 100 lbs. of rubber, of which 60 were first latex rubber and the other 40 a soft-cured wild rubber. The only other ingredients were a small percentage of thiocarbanilide and 5 lbs. of zinc as activator. The energy units are expressed as one-hundredths of a foot pound calculated to a cubic inch of rubber. The relationship is of the character of a rectangular hyperbola, and the hysteresis increases very sharply for elon-



Cyclic Elongation in %. Fig 2.

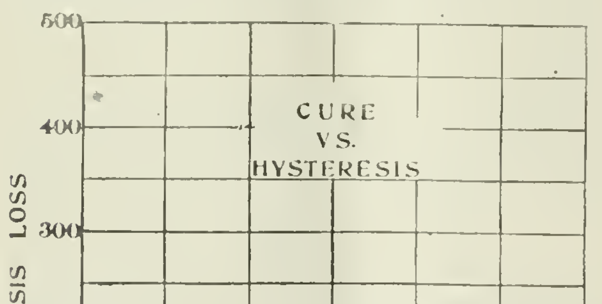
gations exceeding 300 per cent. Viewing hysteresis as frictional loss, it is natural to expect sharply increased friction to accompany the rapidly increasing lateral compressions in the test piece. Following our mechanical picture, it is analogous to contraction of the friction element upon the moving arm.

Adoption of the Standard Loop—For comparison of different compounds and for different cures it was decided to adopt a standard cyclic elongation, and in order to reduce experimental error it was of course desirable to select an elongation lower than 300 per cent., or lying on the flat portion of the curve. For higher elongations the energy loss changes so rapidly with slight changes in the elongation as to make concordant results difficult. Moreover, a brief calculation of the strains set up, for example, in the skim coat of a pneumatic casing run under service conditions shows that under conditions of standard factory practice the rubber is strained to an elongation of not much more than 200 per cent. each time the tire flattens against the road. For comparative purposes we therefore adopted a standard cycle of 200 per cent. elongation.

Relation Between State of Cure and Hysteresis Loss.

It is commonly held by tire technologists that the state of cure of the friction and skim coat of the carcass has a lot to do with the early or late occurrence of ply separation.

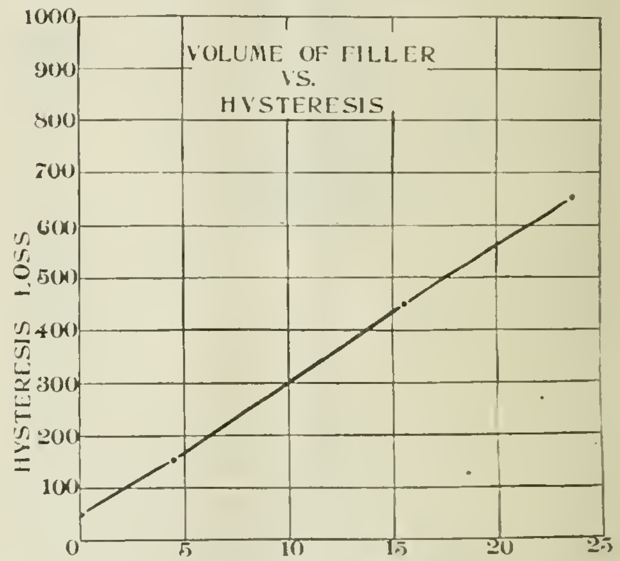
Fig. 3 does in fact show that the state of cure has an influence on hysteresis. What is shown as the normal cure on this chart is the optimum cure as determined by the tensile product. An under-cure of 50 per cent., for example, means that if the optimum curing time is 90 min. at 40 lbs. of steam pressure, the sample was cured for 45 min. Similarly with over-cures. Curves A and B are typical skim coat compounds. Curve C is a breaker compound. It will be observed that minimum hysteresis occurs in the over-cured region. It must, of course, be kept in mind that these data apply only to cycles of 200 per cent. elongation, whereas the aubber stock in question has an ultimate elongation of over 900 per cent. Attention must also be called to the danger of assuming that a slight over-cure is therefore desirable. Aging conditions must be taken into consideration, and the writer is of the personal opinion that the optimum cure or, in many cases, an even shorter cure is the correct condition. It is also noteworthy that the actual magnitude of the hysteresis values characteristic of high-grade pure gum frictions is very low, and that we must look elsewhere for the true cause of ply separation.



Per Cent. Cure. Fig. 3.

The Effect of Compounding Ingredients.

This presents an enormous field of research, and reference will be confined to a brief outline of the basic facts.



Vols. of Active Pigment Mixed with 100 Vols. of Rubber. Fig. 4.

Fig. 4 shows hysteresis plotted against the volume percentage of active pigment associated with 100 parts of rubber. The first point on the curve shows a pure gum compound, the second a lightly loaded breaker compound containing about 4.5 parts by volume of active pigment. The third point represents a very high-grade tread compound containing about 15 volumes of active pigment; the last, another tread stock containing nearly 24 volumes. By active pigments is meant a pigment which definitely increases the energy storage capacity of the compound and includes pigments such as carbon black, lampblack, zinc oxide, the finer clays, etc. It will be noted that for the particular stocks used there is a linear relationship between the amount of hysteresis and the amount of such pigment present. It is also important to note that the effect of the addition of a highly dispersed phase upon hysteresis is much greater than moderate changes in the state of cure of a compound. It is unnecessary to emphasize the importance of this result from the standpoint of practical compounding.

Here again, however, one must use caution not to overlook the importance of heat conductivity and it is entirely within the realm of possibility that a pigment, although markedly

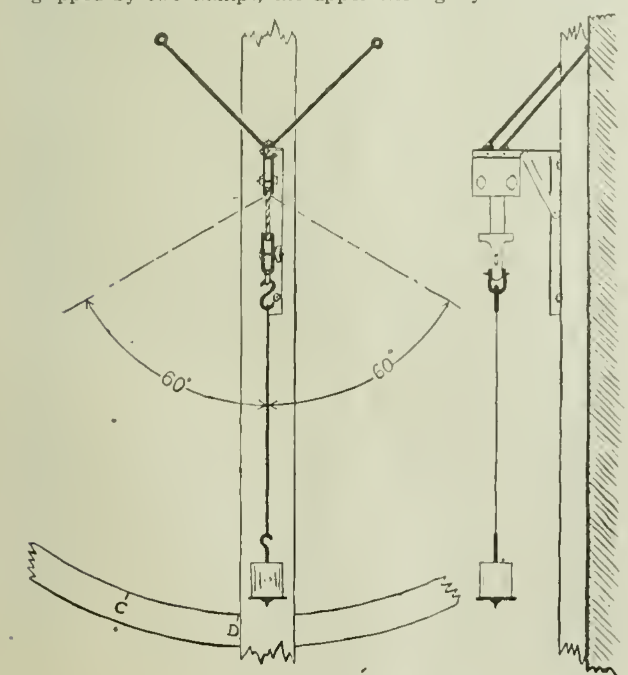
increasing the hysteresis and so also the frictional heat, may at the same time compensate for this by a greatly enhanced heat conductivity. Thus, for example, carbon black not only causes high frictional heats, but is also a bad conductor, whereas zinc oxide, although producing similarly high hysteresis values, has a very much better heat conductance.

It may be of some interest to indicate roughly the actual percentages of energy which are degraded into heat in these various types of rubber compounds. A pure gum friction or skim coat stock when led through a hysteresis loop to an elongation of 200 per cent. degrades about 4 per cent. of the total energy into heat. A stock containing about 5 volumes of zinc oxide degrades about 8 per cent., whereas a tread stock containing say, 20 volumes of zinc oxide degrades in the neighborhood of 14 per cent. of the total energy input in each cycle.

Fabric Energy Losses.

We have dealt thus far with the degradation of energy into frictional losses in and by the rubber substance itself. These are of paramount importance in the case of solid tires, for example. However, in the case of pneumatic tires, which consist primarily of layers of fabric held together and waterproofed by rubber, we have to consider the extent to which frictional heat is developed by the carcass fabric itself. It is true that the hysteresis loss of an inflated casing taken as a whole can be accurately determined by the electric dynamometer. This, however, is an expensive machine, and has the further disadvantage of not being able to determine in what proportion the various constituent parts of the casing contribute to the integral result. The writer has therefore applied the principle of the damped pendulum to the study of casing energy losses. Briefly, the method consists in inserting a 1-in. carcass section in the arm of a pendulum which is allowed to swing from a fixed position until it comes to rest. The more perfectly resilient the carcass wall, the longer will such a pendulum swing. In order to analyze the elastic properties of the various structural components of the carcass, it is necessary merely to strip off the tread and breaker and repeat the series of vibrations with the carcass alone. In order to ascertain the effect of the number of plies of fabric the carcass is stripped down ply by ply and the total period of the pendulum redetermined in each case.

Fig. 5 shows the simplicity of the set-up. The inch section is gripped by two clamps, the upper one rigidly fastened to the wall, the lower attached to the pendulum arm, consisting of thick piano wire about 2 ft. long, weighted down by a cylindrical bob of convenient mass, say 0.5 lb. Time will not permit description of the minute experimental details, some of which are of considerable importance to the accuracy of the results obtained, but briefly the practice was to start the pendulum from a position, say, 60° from the vertical, and take shadow readings on an arc background by means of a fine needle axially inserted into the bob. The "total period" of the pendulum is the number of seconds required for the amplitude to fall from the fixed arbitrary value, say, when the shadow of the needle reaches the point C until the shadow reaches the point D, which is preferably a small distance removed from the position of rest. The length of the carcass strip between the clamps may be varied at will but is preferably about 2 in.



Tire Pendulum. Fig 5.

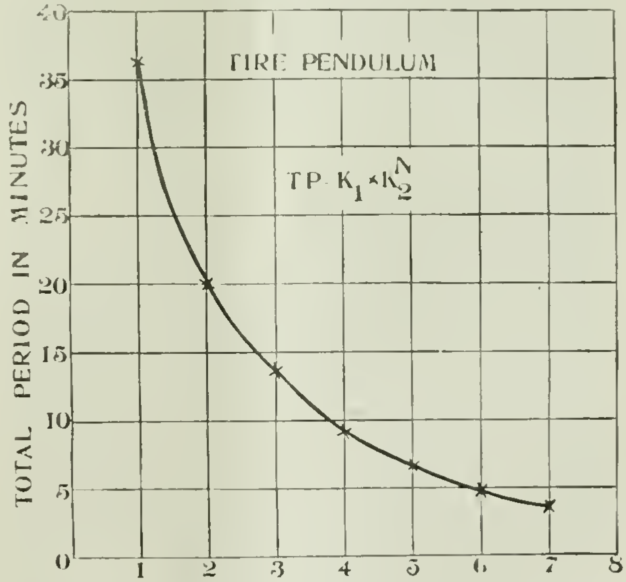
Significance of Total Period—The total period, viz., the time required for the pendulum to damp down from the position C to the position D is clearly a measure of the time required for the potential energy of the pendulum system to fall from that corresponding to the height of its center of gravity when the pointer is at C to that corresponding to D. It is therefore inversely proportional to the rate of generation of frictional heat through the various internal energy losses in the casing section. If the tire were of theoretically perfect resilience the pendulum would keep on swinging forever, except, of course, for external losses due to air resistance, etc.

A typical series of determinations will serve to fix our ideas. A 3.5 In. plain casing gave a total period of 6 min. 42 sec. After removing the band ply of the carcass, the period increased to 7 min. 37 sec. After removing the second ply, to 8 min.; after removing the third ply, 10 min. 55 sec. When all the carcass plies had been removed and the tread and breaker inserted the pendulum swung for 21 min. 4 sec. As a matter of fact, it was found in many hundreds of tests that the total period of the pendulum when plotted against the number of plies of fabric in the carcass lay on a smooth curve, shown in Fig. 6.

This curve is of the exponential type, the equation of which is

$$TP = K_1 \times K_2^{-N}$$

where TP is the total period, K_1 and K_2 are empirical constants,



No. of Plies. Fig. 6.

and N is the number of plies of fabric. An interesting deduction from this curve is that the frictional losses in a casing are not a linear function of the number of plies of fabric. As a matter of fact, the total period for a 5-ply carcass bears the same ratio to that of a 4-ply carcass, as that of a 4-ply carcass bears to that

for a 3-ply carcass. In other words, as the number of plies of fabric is increased the frictional heat increases not in arithmetic but in geometric progression. This constant ratio we have called the "ply factor", and its value in a typical square fabric casing lies very close to 0.7 for ranges of from 2 to 7 plies. If the total period for a 6-ply section is 100 min., that for a 7-ply section will be 70 min. If there were no fabric friction, this factor would of course become unity, except for the small losses due to the skim coat between the plies.

Influence of Gum Stocks on Casing Energy Losses It was at first thought that the condition of the skim coat and friction between the plies of fabric might profoundly influence the casing energy losses and a series of tire sections was therefore prepared of various degrees of under-and-over-cure. To our great surprise the effect of these exaggerated under-and-over-cures upon the total period of swing was entirely negligible in every case.

Effect of Tread and Breaker—Our results, furthermore, showed that, for example, in the case of a 3.5-in. 4-ply casing, the total period of swing for the complete section was almost exactly the same as that for a 4-in. 5-ply casing,stripped of its tread and breaker. We thus see that the entire tread and breaker of a casing contribute no more to the energy losses than does a single ply of carcass fabric.

Cord Construction—These remarkable results made it at once desirable to ascertain the effect of cord construction, the advantages of which, from the standpoint of internal chafing, seemed obvious. Our experiments fully bore out this idea, and in fact we found that a 5-in. cord carcass swings almost exactly three times as long as a square fabric carcass of the same size. Cord fabric is therefore three times as efficient as a transmitter of energy as square fabric. Our purpose in thus briefly describing the pendulum method of investigation is not to expound the behavior of the various structural elements of a casing, but rather to illustrate the usefulness of a simple, convenient, cheap, and yet accurate physical apparatus in helping to solve the pressing problems of our industry.

Effect of Pigments on Energy Storage Capacity.

So much for the transformations of rubber energy and in particular its degradation into frictional heat through hysteresis.

Of equal interest however, is the study of the total energy storage capacity of vulcanized rubber and the profound changes in this quantity which can be induced through the admixture of suitable ingredients. The experimental details of this work have been published elsewhere.[1] The fundamental facts are as follows:

1—A pure gum stock is totally unsuitable for some of the most important technical applications of rubber by reason of its inability to stand abrasive wear.

2—The addition in suitable amounts of certain compounding ingredients enormously improves the wear-resisting power of rubber. Our investigation as to the reasons underlying these facts naturally began with a quantitative study of the effect of the various compounding ingredients upon the mechanical properties of the stock. These properties are very largely expressed by the stress-strain curve, and on selecting a suitable basic mix and adding to it regularly spaced increments by volume of the most important inorganic compounding ingredients, it was at once discovered that profound changes in the character of the stress-strain curve were thereby induced. These changes may be divided into two classes.

One class comprises merely a *foreshortening of the curve.* Thus, for example, the addition to the basic mixing of increasing percentages by volume of barytes produces a stock which when gradually stressed to the failure point preserves the same values of elongation and load as in the case of the pure mixing. The only difference is that failure occurs earlier. In other words, this pigment simply dilutes or attenuates the mechanical properties of the mixing. It plays a passive role.

In the other class the stress-strain relationships are profoundly altered. Thus, for example, if glue or zinc oxide or one of the blacks be added to the basic mix in increasing amount, the mechanical properties of the resultant vulcanisate show the following changes:

First, the curvature of the stress-strain curve is diminished and at suitable pigment concentrations actually disappears. That is to say, rubber can be so compounded as to display the same kind of stress-strain relationship as in the case of steel and the other rigid structural materials, i.e., Hooke's law obtains. Again, certain of these same pigments, if not added in excessive amounts, produce compounds the tensile strength of which at rupture remains undiminished or even increased over large compounding ranges. In these cases the final elongation is, however, markedly reduced. In the other cases, although linear stress-strain relationships are induced, both tensile strength and elongation fall off more or less equally.

It has been thought justifiable in view of these striking differences in behavior to call pigments of the second class active pigments and those of the former class inert pigments.

Table II.

Pigment	Apparent Surface	Displacement of S.S. Curve	Total Energy of Resilience	Volume Increase at 200% El.
Carbon black ...	1,905,000	42	640	1.46
Lampblack	1,524,000	41	480	1.76
China clay	304,800	38	405	....
Red oxide	152,400	29	355	1.9
Zinc oxide	152,400	25	530	0.8
Glue	152,400	23	344	...
Lithopone	101,600	..	...	...
Whiting	60,390	17	410	4.6
Fossil flour	50,800	14	365	3.5
Barytes	30,480	8	360	13.3
			Base 450	

In Table II are brought together along with the energy storage capacities which are here designated the total energy of resilience, the dispersoid characteristics of the pigments in question, and also the increase in total volume of the compounded rubber when stressed to 200 per cent. elongation. These volume increases, for the details of which you are referred to a recent paper[2] by my colleague, Mr. Schippel, prove beyond any doubt that particularly in the case of the inert pigments the application of stress causes a partial separation of the pigment from the rubber with resultant development of vacua at the poles. In the active pigments, those which show a positive effect upon the energy storage capacity, this separation from the rubber matrix is very slight. Column 2, which gives the sq. in. of surface per cu. in. of pigment, indicates that the extraordinary difference in behavior are without doubt attributable to differences in surface energy. When a stock containing one of the active pigments is stressed to rupture, the energy required to do so goes partly towards distorting the rubber phase and partly towards tearing apart the rubber from the pigment particle.

Again, the fact that in the case of the active pigments the rubber remains more nearly adhesive to each particle means more uniform stress on the rubber phase and so enhanced tensile properties and energy capacity.

Surface energy has, of course, two factors. The capacity factor is represented by the specific surface, and it is the variations in this factor which appear to predominate in the behavior of the various pigments. The other factor, the intensity factor, which is represented by the interfacial surface tension, is also doubtless of importance, as is shown by the fact that zinc oxide occupies a somewhat anomalous position in the energy column. It is mainly a more active pigment than would be indicated by its developed surface. Briefly, any pigment of a degree of

[1] Can. Chem. J., 4 (1920), 160; see also abstract in India Rubber World, 63 (1920), 18. Both references give curves illustrating the effect of various pigments on the energy storage capacity of the rubber.

[2] Journal of Industrial and Engineering Chemistry, 12 (1920) 33.

subdivision corresponding to a surface development of over 150,000 sq. in. per cu. in. may be expected to belong to the active class. It must of course be remembered that the activity of a pigment depends entirely upon the percentage present in the mixing. Maximum activity is developed for volume percentages lying between 5 and 25. Inert pigments of course develop no activity no matter how much or how little is added.

The Structure of Compounded Rubber.

In view of the important role played by surface energy in the properties of compounded rubber, and also in view of the recently demonstrated fact of the physical separation of the constituent particles from their rubber matrix under conditions of strain, it is clearly of importance that we should know something about the spacial distribution of the component particles of a mixing. Thus, for example, how much barytes may one add to a compound before the particles actually touch each other? How far apart are the particles of zinc oxide in a tread compound containing say, 20 volumes of this pigment?

These interparticle distances are of theoretical importance, not only for the proper calculation of the forces acting upon the rubber phase occupying the interstices, but also in connection with the influence, if any, of electrostatic charges upon the pigment particles during mixing.

Let us first assume that sufficient pigment has been added to cause actual contact between the particles. Now it is not at all a simple matter to calculate what percentage must be added to bring about this condition. The question involves a study of the theory of piling. Thus, for example, if we fill a quart measure with marbles, the number we can get into the measure depends upon the character of the piling which they assume. If, after laying in the first layer we place succeeding layers in such a way that each marble lies vertically over and touching the one beneath, we obtain what is known as cubical or loose piling. If, however, we shake the marbles down until they lie together as closely as possible, the piling assumes a totally different character, known as normal, close, or tetrahedral piling.

This question of cubical or tetrahedral piling is important in all studies of granular bodies. Thus, for example, the rigidity of mortar under the trowel, or the firmness under the foot of the wet sand on the seashore are both due to the fact that the granules are in a condition of close or normal piling, the disturbing of which by an external force requires an increase in the over all volume, which in turn is resisted by the vacua which tend to be formed.

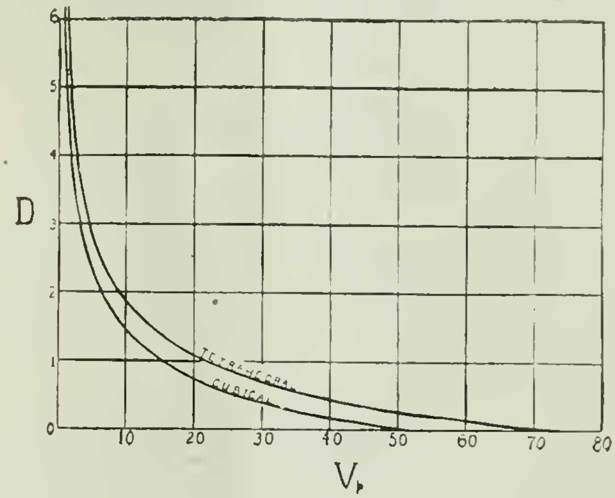
If a test tube be loosely filled with sand and subsequently gently tapped, the sand will settle down a considerable distance in the tube. The sand was originally more or less loosely piled. It was certainly not piled in the most loose manner possible, namely, cubically, but occupied some intermediate position. On gently tapping the tube the particles are freed, and, attracted downward by the force of gravity, assume a spacial arrangement more nearly normal or tetrahedral.

The Piling of Compounding Ingredients—We have now to consider what happens when a pigment is worked into the rubber in a plastic state on our mix mills. Owing to the high viscosity of the gum the force of gravity is not free to act as it did in the case of the sand in the test tube or the marbles in the quart measure. Taking first a case where so much pigment is added that the particles are compelled to touch each other, it is possible to calculate the amount of pigment required on the assumption, first, that the particles are arranged cubically or loosely, and, second, tetrahedrally or closely.

On the former assumption, irrespective of the size of the particles (which are, however, assumed to be uniformly spherical), the amount required would be 52.4 per cent. of the total volume. On the second assumption, the figure comes out at 74.1 per cent.

Now it is a well-known fact in mill practice that a compound containing 50 per cent. by volume of pigment is almost unmanageable on the mill. We therefore deduce that with the customary amount of milling the pigment particles probably exist in a condition more closely approximating the loose or cubical piling than the close or tetrahedral piling. The writer has, however, observed that in working with extremely heavily loaded stocks it is possible, by continual milling, to bring about a more or less sharply defined increase in plasticity with the possibility of working in an additional amount of pigment. With due regard to the breaking down of the rubber owing to this excessive milling, it still remains highly probable that the additional mastication has caused a more even distribution of the rubber phase throughout the mass, which is equivalent to saying that the particles have been rearranged to more nearly normal piling. The writer has in fact succeeded in milling in over 60 per cent. by volume of pigment in this way (i.e., 60 volumes pigment to 40 volumes rubber.)

Spacial Arrangement When not in Contact—Fig. 7 shows interparticle distances for percentages of pigment ranging all



Interparticle Distance vs. Volume, Per Cent. Pigment.

the way from 0 to 80 per cent. The ordinate D shows the distance between the particles referred to their radius as unity. The upper curve shows conditions when the particles are tetrahedrally disposed. Under working conditions in the factory very few compounds contain more than 35 per cent. by volume of pigment. Taking, for example, a typical tire tread compound containing, say, 20 per cent. of pigment by volume and assuming tetrahedral arrangements, the particles will be distant from each other by a little over their own radius. Assuming cubical arrangement they would be closer together, namely, distant by about three-quarters of their radius. This of course presupposes spherical shape. In actual practice, the pigment particles are by no means spherical, but on the average they are more nearly spherical than any of other definite geometrical shape, and the error due to assuming sphericity will not be large.

The question as to whether in such cases where the particles are not in actual contact one ought to assume a tetrahedral or a cubical space arrangement is (at least to the writer) very difficult to answer by mathematical analysis. It should be quite possible, however, to reach an approximate solution by numerous direct microscopic measurements on thin sections by transmitted light, and we hope to secure results of this kind in the near future. In any case the values shown on this chart represent the extremes between which the true values must lie, and we are of the opinion as intimated above that the action during milling is that the rubber phase will tend to become as evenly distributed as possible, and that therefore the tetrahedral arrangement is the more nearly in accordance with actual conditions.

The writer fully realizes that the foregoing analysis hardly even scratches the surface of the problem of the structure of

compounded rubber. Of cardinal importance are, for example, the direct measurement of the surface tension between zinc oxide and rubber, carbon blacks made under different conditions and rubber, and so on. When these values are once determined the capacity factor of the surface energy as measured by the average degree of dispersion of any given pigment can in our opinion be most accurately measured by its admixture under standard conditions in a rubber compound, and the determination of the decrease or increase in energy storage capacity as compared with other samples of the same pigment. This would seem to be of particular value in the case of the finer pigments such as the blacks, the individual particles of which are beyond the resolving power of our microscopes.

Reverting to the title, "Rubber Energy," we see that along with its already distracting array of properties chemical, rubber provides the thermodynamician with plenty of nuts to crack. The interrelationships of its thermal, mechanical, and surface energies make up a field of research which has lain fallow long enough and which should be zealously cultivated.

MINING IN QUEBEC IN 1920.

By THEO C. DENIS.*

Whether or not the total figures of mineral production of the Province of Quebec for 1920 equal or surpass the 1919 production will depend on the value of the building materials, and it is very difficult to foretell beforehand what this value will be. Quarrying, brickmaking and cement manufacture have been active, but it is only from the returns of operators that figures can be arrived at.

Asbestos has held its own, and it is not expected that the production will show a great variation from last year's. During the first six months this industry was very active, and although somewhat hampered by the difficulties in obtaining cars for shipments, the tonnage and the value showed an advance as compared with the corresponding period of 1919. The demand was keen, the United States market absorbing almost all of it. The second half of the year was marked by the closing down of two of the important mines for a period of nearly five weeks, owing to a strike brought on by the exigencies of labor, to which the operators could not or would not acquiesce. The strike ended by the miners returning to work unconditionally, at the old terms and rates. During the three last months of the year the American market has appeared to be somewhat satiated, the demand and orders becoming perceptibly slower. This, however, had practically no effect on the prices, which kept firm, owing to the European demand, the English and French markets having had to be somewhat neglected during the previous months. The asbestos operators have taken advantage of this era of prosperity to push on development work, to block out reserves, and to improve methods of working. As an example, it may be mentioned that one of the companies has been putting down many thousand feet of diamond drill holes, has given a contract for the removal of 600,000 cubic yards of overburden to give access to the new ground, and that they count on having a reserve blocked out for thirty years' mining at the present rate of production. The figures for the first six months of 1920 show a production of asbestos and asbestic of 82,500 tons valued at 5,763,000 dollars, whereas for the previous twelve months they were 160,000 tons valued at $10,995,000.

In the chromite industry two operators have shown their faith in its permanency by erecting some very substantial concentrating mills. One was built by the Mutual Chemical Company of Canada, mainly to treat their ore from their mine on lot 1, N.W. range X. of Coleraine. This was started early in the year, and has given very good satisfaction. The second concentrator, which is built within a few hundred feet of the first, on the adjoining lot, is that of the J. V. Belanger Mining Co., and it has a capacity of 180 tons of ore a day, giving about 30 tons of chromite concentrates at 50 per cent. This was started in July, and the efficiency of the mill may be gathered from the facts that the shipments for the first month of operation of the mill totalled 600 tons of concentrates. Practically the whole production of this company went to the American Alloys Company. The Black Lake Asbestos and Chrome Co. worked their Caribou Lake mine during the early part of the year only. The production was limited to "crude," that is, lump ore assaying from 35 to 40 per cent. of sesquioxide.

The magnesite industry of Argenteuil County is now well established, and two of the operators have erected very complete sintering plants near the quarries, for the production of dead-burned magnesite. The capacity of these two plants is 75 tons of finished product a day, requiring approximately 150 tons of crude magnesite. Heretofore the clinkering was done in cement plants, in Hull and in Montreal, which entailed railway transportation of the raw magnesite.

The mica industry has been active. Production will be higher than in the previous year. Quebec's output of this substance is approximately 80 per cent. of the total Canadian output.

There has been a keen demand for feldspar, both for ceramic purposes and for enamelling. Several new deposits were opened during the year and shipped feldspar, mainly to pottery centres in the United States.

Pyrites mining has been very inactive, only the Weedon mine having been in operation. The Eustis mine has not reopened, having closed down in April, 1919, after forty years of practically continuous exploitation. The market for iron pyrites for the manufacture of sulphuric acid has been very dull. The sulphuric deposits of Louisiana and Texas have been increasing their production to a very great extent, and this has had a marked effect on the demand for pyrites.

On the whole, metalliferous mining has keenly felt the drop in prices of all the metals. According to New York quotations, copper is now 28 per cent. lower than in the early part of the year; zinc has dropped 34 per cent and lead 45 per cent. as compared with prices in February and March, and the operations of our mines of these metals have decreased in proportion. Nevertheless, the Zinc Company worked their Montauban mine with comparatively few interruptions, and the Federal Zinc Company, who are developing a very promising deposit of zinc and lead ore in Gaspé County, worked actively on the construction of the road, 42 miles long, which will connect the mine with the railway and enable them to haul the concentrates by tractor.

Very little prospecting was carried on during the year, and practically no development work was done on the gold occurrences of Lake de Montigny, in the Abitibi region.—Canadian Mining Journal.

*Superintendent of Mines for Province of Quebec.

The Marsh Electrolytic Cells for Chlorine and Caustic Soda

Description of a Relatively New Type of Electrolytic Cell and a Statement of Advantages Arrived at Through the Utilization of Its Principles

By CLARENCE W. MARSH*

ELECTROCHEMICAL enterprises in the past have been regarded as profitable only in locations where cheap power could be obtained. This has led unconsciously to the consideration that the amount of power used is comparatively a minor expense.

If, on the other hand, there had been no cheap power the design of the equipment and particularly electrolytic cells would have been developed much more rapidly along the lines of conversation of power. This would have led indirectly to a much greater consideration of the practical application of electrolytic principles to the last degree. Perhaps cheap power is a thing of the past. This immediately brings us to a close and careful scrutiny of the best methods for using power more efficiently.

Small bulk and highest efficiency seem to go together when proper steps are taken in design. The two things of conservation of material and power go hand in hand.

In some respects a direct comparison can be made with the development of steam prime movers wherein the old reciprocating engine has been discarded in favor of the small bulk of the steam turbine and the high efficiency obtained in the production of power because of the close adherence to scientific principles.

Let us conceive how it is possible to obtain a maximum active surface of electrodes with a minimum amount of material in the electrodes. If you can utilize the entire surface of the electrodes in close proximity to each other, then all that remains is a practical form. In the Marsh Electrolytic Cell, this fundamental consideration has been worked out by arranging a series of horizontal cylindrical elements for anodes arranged in a vertical or inclined position, one above the other. The perforated steel plate with the intervening diaphragm has been arranged to conform closely to the surface of the anodes in the form of corrugations. The following results are immediately obtained:

Fresh brine is always present between the electrodes. The frequent intervals between the anode elements make this possible. This short path between the intervals insures a brine that is always saturated.

The polarization due to gases is minimized because the shape and arrangement of the electrodes throw the gases back and away from the active zone. At the same time we obtain a more positive circulation. The internal resistance due to the accumulation of gas bubbles is almost entirely removed. The result is the very lowest possible voltage that could be obtained in a cell of minimum height.

The elements forming the anodes can be so placed in the corrugations of the cathode that the entire surface of the anodes becomes active as well as the entire surface of the cathodes. It has been demonstrated that as the graphite wears away the wear is very uniform on the whole surface. The voltage is also very uniform, largely because as the interval increases the increased voltage which would be the natural outcome is diminished by the more active circulation of the electrolyte. The low voltage obtained due to the increased active surfaces confines the wear on the graphite to the active elements and the leading in posts show very little wear. The uniformity of wear on the graphite elements is one of the positive advantages. Graphite is usually wasted due to the irregular wear and some of the graphite must be thrown away due to this irregularity of wear in the old type of cell.

On account of the largely increased surfaces of electrodes, the amount of graphite deposited on the diaphragm becomes very much less. In the first place, the surfaces are larger. In the second place, the wear is less due to the decreased voltage and there is less graphite destroyed. The result is that diaphragm changes may be decreased very much even with paper diaphragms Normal operating periods of three or four months are extended to five or six months time. Six months periods are extended to nine months or longer.

It can be seen from the above that very much less material is required for obtaining the same results. This conservation of material makes it practicable to design an electrolytic cell requiring less building space and on account of light weight may be handled by cheap overhead cranes or on rollers.

Marsh Electrolytic Cells can be made about twice as deep as has been usually considered practicable. Heretofore, as a cell was increased in height the interference of polarization from gas bubbles increased the voltage more and more. In this way a height of about 15" was the limit. Now it is possible and practicable to build cells with active surfaces about 30" in height. This decreases the floor space required by one-half. At the same time 50% more active surface is obtained. We can utilize this in decreasing the power used at least one-sixth or we can utilize it in increasing the output per unit of space occupied by approximately 50%.

But we are not limited in conserving space to this one consideration. The cells are very much lighter and can be arranged at a minimum distance center to center, and easily handled by the overhead cranes, thus doing away with the unnecessary spaces between. Aisles can be made very much narrower. In some cases as little as one-fifth of the space is required. At the same time, the power required has been diminished by at least one-sixth of the former amount used.

Conservation of Electrodes

The material used in the equipment has been diminished on account of the smaller cubic space required. The active electrodes which are eventually destroyed, are conserved in two ways.

First, only two-thirds of the material is required and this is destroyed at two-thirds the rate, due to the conservation of one-third of the wasted power. It means that less than one-half the usual expense for graphite is necessary. The direct outcome in handling less material occupying less space is the smaller demand for labor. The material does not have to be renewed as often and there is less material to be renewed. The amount of building space occupied being so much less all the accessories with which a cell building is equipped are enormously decreased. All these things depreciate rapidly and are important considerations.

The outcome is that cells of this type will make it possible to decrease the investment for buildings and cells by one-half. Roughly, the production costs of chlorine and caustic soda can be diminished by one-quarter.

In proportion as the capital necessary for an installation for an electrolytic plant is reduced, the feasibility of producing chlorine and caustic soda for an industry's own use is increased. Especially is this so when the care and attention and the number of units required are decreased. In the Marsh Cells this is particularly noticeable in that units for the same output can be made larger. In this way fewer units are required and less attention demanded from operatives.

There is another important consideration in connection with the possibility of producing cheaper chlorine, bleach, and caus-

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tic soda at the plant where it is consumed. Bleach is rapidly being displaced by liquid chlorine for the simple reason it has been such a nuisance that it has been very expensive to handle. Bleach also takes large storage space. The deterioration of bleach in the steel drum is serious especially in summer.

Liquid chlorine is very efficient and comparatively easy to handle. There arises, however, an important consideration which every concern should have in mind. Chlorine should not be stored in large quantities except in places where, if it gets beyond control, it does a minimum damage. Fire risks involve a consideration of possible accidents and interference in fighting fires if they occur. This in turn will call for greater and greater precautions in storage of liquid chlorine and naturally greater and greater expense in forestalling accidents due to whatever cause

The main reason for purchasing bleach or chlorine in the past has been the feeling that power costs are so great that the only possible location for an electrolytic plant is in the neighborhood of cheap power. But we are faced with the condition that practically there is no such thing as cheap power. Furthermore, the Marsh Cell shows that power can be conserved to such an extent that the saving in expense of other materials on account of the saving power amounts to nearly twice the saving in power in an average case.

Commercial Uses for Chlorine

The enormous extent to which the chlorine market can be increased is probably at first sight not apparent to the average man. Chlorine is one of the most active chemical elements. It only awaits a gradual decrease in cost when it will immediately replace other more expensive chemical elements now used in reactions. In the metallurgical field, certain ores have been discarded because of the great expense of treatment by use of chlorine which in many cases is the only method through which the metal can be recovered. As soon as chlorine is made cheap enough there are enormous bodies of ore which will be immediately available and the value of such properties will at once increase. The market will grow in proportion.

Germany, before the war, was an enormous producer of cheap chlorine. It was cheap largely because of the necessity of obtaining alkali, such as potash, by means of electrolytic processes. This made chlorine available for which an outlet was necessary. It was sold as a by-product. The result is known to all. Germany was practically the only large producer of dyes and synthetic products owing to the cheap chlorine and other raw materials.

Canada and the United States must obtain cheap chlorine in order to hold their position as a producer of bleached pulp and dye stuff intermediates and synthetic products. Good cheap paper of the better grade requires enormous quantities of chlorine in the form of bleach. The cheaper chlorine is produced the more a higher grade of paper becomes available to a larger number of consumers. It immediately reacts in an increased demand for chlorine. From this point of view, it should be to the interest of every consumer and producer, large or small, to encourage and use any and all improvements for producing cheap chlorine, cheap bleach and cheap caustic soda.

Any suggestion toward a successful commercial utilization of the Marsh Electrolytic Cell is welcome. Small installations for specific uses, such as water purification in all municipalities becomes more feasible. It obviates the necessity of transporting large quantities of chlorine and will displace the large amounts of capital tied up in expensive containers for the transportation of liquid chlorine. It will diminish the dangers due to accidents to such containers.

In out of way places and foreign countries or under special conditions, if it is desired to operate with flat anodes and cathodes, Marsh Electrolytic Cells can be furnished with these older forms of electrodes. Not only will the advantages of the improved methods of construction and arrangement be obtained but special anodes are furnished calling for no machine work whatever and reducing the cost of graphite very much. The cells have a very low cost and operate at the usual energy efficiencies, namely, around 50%. While only part of the benefits can be obtained with the ordinary flat electrodes, yet it gives a decided improvement over older forms.

Laboratory cells are available and furnish an excellent idea of the latest and best practice in producing electrolytic chlorine and caustic soda.

PRODUCTION OF CAMPHOR IN THE UNITED STATES.

Two of the largest consumers of camphor in the United States, E. I. du Pont de Nemours & Co. and the American Celluloid Co., have essayed to defeat, at least in part, the monopoly which the Japanese Government maintains on the supply of camphor by growing their own. This fact was brought out Monday evening, January 10, by William R. Webb, assistant superintendent of the chemical plant of the Eastman Kodak Co., in his talk on "Camphor, Natural and Synthetic," before the Rochester Section of the American Chemical Society.

In 1910 the American Celluloid Co. set out a camphor-tree grove of 3,000 acres in Florida, and five years later the du Pont Company began a much larger camphor-tree farm in the same State. The trees are pruned each year and the clippings distilled. From them nearly two per cent. of their weight in camphor is obtained. When the trees stop growing rapidly they are cut down and the whole tree is distilled for camphor. In the meantime younger trees are kept ready to take the places of the older ones.

The Japanese Government controls the harvesting, reforesting and distilling of its camphor trees. At one time it produced practically all of the camphor used in the world, which is variously estimated at 10,000,000 pounds a year. To overcome this monopoly Germany and France began competing with the natural product through artificial camphor produced in their chemical plants from turpentine. The war stopped the production of this synthetic camphor, so that to-day the groves in Florida are the most formidable competitor of the Japanese monopoly. —"Chemical and Metallurgical Engineering" (New York).

LEVER BROS. ACQUIRE LARGE LINSEED CORPORATION.

Lever Brothers Co., of Cambridge (Mass.), has increased its capital from $12,000,000 to $150,000,000, the increase being necessary for the acquisition of the American Linseed Co. The latter-named company was incorporated in December, 1908, in New Jersey to consolidate a number of independent mills with those of the National Linseed Co., then in process or reorganization. The company is engaged in the business of manufacturing American and Calcutta linseed oil, raw, boiled, and refined varnish, oil cake, oil meal, and crushed flax seed. The active plants owned by the company include Dean Linseed Oil Works, the Grove Linseed Oil Works, Kellogg & McDougall Works, Northwestern Linseed Oil Works, Pacific Oil & Lead Works, Portland Linseed Oil Works, Sioux City Linseed Oil Works, and Wright & Hills' Linseed Oil Works. It is further stated that the company owns selling and distributing stations, with an aggregate storage capaciy of about 3,000,000 gallons.

Consumption of Reagents Used in Flotation

By THOMAS VARLEY*

As a result of many requests received from individuals and mining companies for such information, the United States Bureau of Mines sent to milling and ore-dressing plants a questionaire asking for data on the tinnages treated both by gravity concentration and flotation, the tonnages of concentrate produced by each system of milling, and the consumption of oil, acid, and other reagents, as well as the kinds used. these returns to cover the calendar year 1919.

The reports showed that there were 26,545,564 tons of ore of all kinds treated by flotation, from which 3,105,343 tons of concentrate was produced, showing a concentration ratio of 8.55 tons into one. The total of all oil, acid and other reagents used was 113,510,234 pounds, equivalent to 4.2384 pounds per ton of ore treated. Of the total quantity of ore treated, by far the greater part was copper ore. Tabulations for the various ores are given, in detail showing s summation of all reports received.

Gold-Silver Ores.

Not many reports were received from companies treating ores of gold and silver. In the plants making reply, there was treated 75,081 tons of ore, yielding 8,698 tons of concentrate, a concentration of 8.63 into one. Oils used were petroleum fuel oil, 42,054 pounds; pine tar oil, 24,720 pounds; and turpentine, 36,320 pounds.

Graphite Ore.

The number of tons of graphite ore treated was 55,980, yielding 906 tons of concentrate, a concentration of 6.18 into one. Oils and reagents used were pine oils, soda ash, and lime, aggregating 250,700 pounds in all.

Miscellaneous Ores.

This class includes ores of the rarer metals, such as molybdenum and antimony, and complex mixed ores of various kinds. There was treated 73,690 tons, yielding 5,840 tons of concentrate, the ratio of concentration being 73,690 tons, yielding 5,840 tons of concentrate, the ratio of concentration being 12.62 into one. Oils and reagents used were sodium sulphide, 73,360 pounds, soda ash, 133,770 pounds; sodium silicate, 111,136 pounds, and pine oils, 22,786 pounds.

Copper Ores.

In tabulating the returns for copper ores, all plants that were treating ores solely by gravitation methods have been excluded. Many companies, however, use a combination of gravity concentration and flotation. Usually flotation supplements gravity concentration, although in a few plants the reverse was reported. Of 38,255,707 tons of ore milled, 23,265,832 tons or 60.8 per cent. was treated by flotation. This would indicate that 39.2 per cent. was discarded as tailing low enough in metal content not to warrant regrinding for further treatment, although a certain small proportion would represent concentrate removed by concentration machinery.

The total amount of oil, acid, alkaline reagents, and all other flotative reagents used averaged 4.6360 pounds per ton of copper ore treated. In the following table the total amount of each reagent used is also calculated into average number of pounds consumed per ton of ore. This figure of course does not represent the average consumption in any one flotation plant, but nevertheless is of interest. Some plants use large quantities of one reagent, either oil, acid, or alkali, whereas another plant may not use any of the flotative reagents employed at the former plants.

It will also be noticed that the oils have been grouped somewhat under general headings. All the special brands and makes of coal-tar creosote, hardwood creosote, pine oils, pine tars, etc.

The total amount of copper ore treated by flotation was, 23,265,832 tons, producing 2,837,660 tons of concentrate, a concentration ratio of 8.23 into one. The following table shows the kinds and amounts of oils and reagents used for this tonnage.

	Pound	Equivalent in pounds per ton of ore treated.
Coal tars	20,488,275	0 8787
Coal-tar creosotes	1,399,170	0601
Hardwood creosotes	1,774,722	0767
Pine oils	2,142,065	0920
Pine tars	1,064,199	0498
Fuel oil	212,985	(099
Sulphuric acid	70 290,505	3 0254
Caustic (Kind not stated)	1,570,200	0675
Kerosene acid sludge	7,935,200	.3402
X coke	228,740	0099
Xilidine	188,472	0088
Turpentine	23,310	0009
Other Oils	375,000	.0161
Total average number of pounds of oils and other reagents used per ton of ore treated		4.6360

Lead and Lead-Silver Ores.

The tonnage of lead and led-silver ores treated by flotation is considerably less than that of copper ores. This may be due to the fact that in the former, the values are more segregated than in copper ores, in which the mineral constituents are generally finely disseminated. Generally flotation supplements gravity concentration, and a large tonnage of material or tailing low in metal content can be discarded. This is especially true in the south-east Missouri lead district.

The returns show that the total quantity of these types of ores treated by combined gravity and flotation methods was 6,742,815 tons. Only 1,671,740 tons, or 24.78 per cent. of the total tonnage reported, was treated by flotation. This 1,671,740 tons retreated by flotation produced 147,552 tons of concentrates a concentration ratio of 11.33 into one.

A list showing the oils and other reagents used for treating this tonnage, and the amounts consumed follows.

	Pounds	Equivalent in pounds per ton of ore treated.
Coal tars	324,861	.1943
Coal-tar creosotes	71,860	.0430
Hardwood creosotes	642,051	.3840
Pine oils	221,416	.1324
Pine tars	22,904	.0135
Wood tars	86,926	.0520
Crude petroleum	318,544	.1905
Sodium sulphide	151,212	.0904
Cresylic acid	12,069	.0072
Sulphuric acid	98,027	.0586
Kerosene	9,707	.0057
Gasoline	2,934	.0017
Soda ash	95,210	.0570
Sodium silicate	144,371	.0863
Niter coke	161,270	.0964
Other reagents	86,720	.0517
Total average quantity of oils and reagents used per ton of ore treated by flotation		1.4647

Zinc Ores.

The reports show that 2,917 tons of zinc ore was treated by combined gravity concentration and flotation, while 1,563,482 tons or 53.59 per cent of the total tonnage was treated by flotation alone. This yielded 211,302 tons of concentrate, a concentration ratio of 7.39 tons into one.

General Remarks.

The most generally used flotative agents for copper ores are sulphuric acid, kerosene acid sludge, and the coal tars. For lead and lead silver ores hardwood creosote is used the most, followed by coal tars, crude petroleum, and pine oils in the order named. Most important for zinc ores are the pine oils, which constitute 43.5 per cent. of the total quantity of oils used for this ore, with copper sulphate and hardwood creosote next in importance. Among the other flotative agents used are such materials as sulphur; specially prepared and fractioned oils,

*Metallurgist, U.S. Bureau of Mines.

both of coal creosote, wood creosote, and pine oils; also various sodium salts, ammonia, ammonium salts, etc.

No list itemizing all the oils and flotative agents used can be prepared as some of the replies were not specific and many of them were stated in general terms, for instance: "Caustics", "Miscellaneous alkaline reagents", "Other fractionated oils", etc. However, the proportion of such reports is small, and the information gathered should be sufficiently accurate for general purposes.—Abstracted from U.S. Bureau of Mines, Reports of Investigations.

Chemical Society News

General Letter to Fellows and Associates of Canadian Institute of Chemistry.

GENTLEMEN:—

It is felt that the members of the Canadian Institute of Chemistry will naturally wonder what has been going on between the date of the last annual meeting and the present time.

The first thing of importance after the annual meeting was the carrying out of the ballot and thereby obtaining a council. Owing to the geographical disposition of the members, particularly in view of the summer vacation, the completing of the modus operandi was considerably delayed. Having obtained a council, it was then necessary to vote in the council upon the offices of President, Vice-Presidents and Secretary. For the same reasons as already stated, this matter took considerable time. Having obtained a president, it was necessary to appoint an examining board to deal with applications. It was thought best by the president and secretary that all applications received after the annual meeting should be dealt with by the examining board and not by the then officers of the institute, who only held office during the hiatus. This resulted in the examining board having to deal with an accumulation of applications. Those were then dealt with as rapidly as possible and the interested parties duly notified of the result.

A committee was appointed to look after the question of incorporation of the Institute in accordance with correct legal procedure and this matter of incorporation has been steadily progressing. It is hoped that a definite report in this connection will be forthcoming in the next issue of the Journal.

During all this period the question of student membership had been steadily developing. Letters had been received by the Secretary from the chemical students of the universities stating that they had meetings and decided to approach the Institute with the view of getting a classification introduced that would permit of their affiliating themselves with the Institute, in a student capacity. Letters were also received from chief chemists in some of the large laboratories stating that several of their staff, while not qualified for Associateship at the moment, were yet desirous of becoming affiliated with the institute on a student basis.

In addition to these letters some were received from the directors of chemistry in the universities strongly urging that student membership be provided for. Careful consideration was given by the Council to all these correspondents and the outcome has been the decision of the council to provide for student membership as outlined elsewhere in this issue. One thing that is still evident amongst the chemists of Canada is that there still exists a desire for new and separate chemical organizations as opposed to the wholehearted support of the present and only strictly professional chemical body. This seems to be a view-point to be deplored. To many of us the number of organizations to which we feel we ought to belong is already too great and one looks rather to the reduction by amalgamation of the existing scientific societies rather than their increase by the incorporation of new ones, moreover it seems to be of the greatest importance to the profession in Canada that there should be a common meeting ground for the chemists of the East and West, for after all the professional interests and requirements of the chemists in Vancouver, Calgary, Halifax and Montreal are essentially the same and we should meet rather on the basis of our professional status than on our geographical position. It is hoped that the provision for student membership just made by the Institute will be accepted as evidence that the Institute desires to enlarge its scope in every way that is found to be for the good of the profession as a whole and that any who may not yet find in the Institute provision for something in connection with which they are specially interested, will join the Institute and work from within to obtain those results which they desire.

The Employment Bureau has actively followed up all cases submitted to it. What is needed is greater use of the Bureau by employers of chemistry, the ideal being that the Employment Bureau of the Institute should be the one central point in Canada to which may apply both chemists and employers of chemists whenever they are in need.

At the date of the annual meeting the total membership of the Institute was as follows:—

Honorary Fellow	1
Fellows	138
Associates	3
Total Membership	141

As compared with the figures at December 31st, 1920, which read:

Honorary Fellow	1
Fellows	157
Associates	16
Total	174

While this growth is not rapid it is steady and it must be borne in mind that particular care is being exercised by the Examining Board to build up the status of the Institute by adhering strictly to the requirements as set forth on the application forms.

At the date of writing a number of the chemical plants and plants employing chemists have been reducing their staffs with the result that many chemists are out of positions and that no vacancies are open for chemists so far as the Institute is aware. It is hoped that this condition of things will have changed to some extent by the time this letter is in the press, but looking broadly over the field, one would say that it will be the late spring before there is any general improvement and that in the meantime every chemist who has a position is wise to cultivate it and await the coming of summer before attempting to make any change other than that of going to an assured position immediately.

The secretary would take this opportunity of asking both the members of the Institute and chemists generally to feel free to write him on any matters of interest affecting the profession. It is the desire of the council that they serve the chemist in any matter which he considers of interest.

HAROLD J. ROAST,
Secretary Canadian Institute of Chemistry.

Montreal, Jan. 12, 1921.

Proposed Qualifications and Regulations Regarding Student Membership in Canadian Institute of Chemistry.

"After careful discussion amongst Members of Council, it has been decided to provide for Student Membership in the Institute along the following lines.—

"That the following be the requirements for Students:— One who shall be between the ages of seventeen and twenty-five, who is following a definite course of chemical training, is

possessed of a good general education and is otherwise satisfactory to the Examining Board.

A Student may apply for Associateship whenever he considers himself qualified. Upon reaching the age of twenty-five the Student membership shall be cancelled. The former Student member may then apply for Associateship in the ordinary course.

The Student member shall have no right to any degree by virtue of his being a student member nor shall he have an individual vote in the affairs of the Institute. Representation shall, however, be provided for the Student membership as a whole in the sppointment by the Student membership of three representatives who shall be made party to any discussion affecting the rules and regulations of the Institute to the same extent as any other ordinary member.

The fees for Student members shall be $3.00 per annum, payable on the 1st of January of each year, which fee shall include a free copy of the Journal of the Institute. There shall be no initiation fee.

The form of application for Student Membership shall be the present form, the same to be filled in, in-so-far as the applicant finds it to be possible."

H. J. Roast, Secretary.

MEETING OF MANITOBA CHEMICAL SOCIETY

Before a well-attended meeting of the Manitoba Chemical Society which was held on January 11th, Mr. E. L. C. Forster, analyst-in-charge of the Federal Health Department's laboratory in Winnipeg, read a paper on "Photo-chemistry." Mr. Forster approached his subject from the historical view-point, tracing the evolution of the very rapid films and plates of the present day. from Daguerre's silver plates sensitized by exposure to iodine vapor and developed with mercury. It was pointed out that the nature ot the chemical changes which take place when silver halides are acted upon by light is still not clearly understood, and little is known as to the composition of the latent image. Similarly, our knowledge of what goes on in the developing bath is also incomplete. Various theories have been advanced to explain these processes, and those which seemed to be most strongly supported were dealt with as fully as possible in the time at the speaker's disposal.

After referring to the fixing, intensifying and reducing of the negative, Mr. Forster said a few words with regard to orthochromatic photography, explaining that in order to bring the visual intensity of light into closer relation with its photographic effects, it was necessary to introduce certain organic dyes into the gelatine coating of the plate.

A brief account was given of the more important methods of printing, including the calatype process. This process depends upon the reaction between pyrogallic acid and potassium bromate, (resulting in brown colorations) which takes the place in the presence of the metallic silver or platinum of the image; or, in the modified process, upon the catalytic action of these finely divided metals in bringing about the decomposition of hydrogen-peroxide. By the use of this modified method, prints may be copied directly in a very short time and with excellent results.

Turning to color photography, the speaker referred to the different methods by which colored photographs may be obtained. The Lumiere, Lippmann's, and Joly's processes were each explained, and at the conclusion of this interesting and comprehensive paper, some very fine autochrome lantern slides were shown.

W. A. Alcock,
Secretary, Manitoba Chemical Society.

On December 14th, the members of the Manitoba Chemical Society held a meeting at the Manitoba Agricultural College, when they were the guests of the Chemistry Department staff. After an inspection of the College buildings, Dr. Clevenger gave a lecture on "The Use of the Hydrogen Electrode in Agricultural Investigations."

The investigation, to which the main part of the paper was devoted, was carried out with the object of finding the effects of soil acidity on legume bacteria. The speaker explained that as this was one of the earliest applications of the H. electrode to agricultural research, a considerable amount of preliminary work had been necessary. External factors had a great influence on the results—a fact which was illustrated by curves showing the cycle of changes taking place during the day in the H ion concentration in plant juices.

Experiments were made to determine the relation between the acidity of the soil and that of the juices from the plants of cow peas grown thereon. It was found that, while the H ion concentration in the root juices was directly proportionate to that in the soil, the juice of the leaves was more acid in those cases when the acidity of the soil had been reduced by the addition of lime.

The investigation also included the determination of the lowest H ion concentrations which prevent the growth of bacteria associated with the various legumes. The development of the bacteria of the alfalfa plant was found to be stopped if the acidity of the medium exceeded PH=4.9. The N—fixing bacteria of the lupines continued to grow until the PH value of the medium reached 3.15, while the growth of other legume bacteria was arrested at various H ion concentrations between these two points.

Professor Clevenger concluded with a discussion of the possibility of applying this method to other lines of agricultural research.

Ottawa Section, Society of Chemical Industry.

At a well attended meeting of the Ottawa Section, Society of Chemical Industry, held January 19th in the Carnegie Library, papers on Vitamines or Food Accessories were read by R. S. Stevens, M.D., and Col. J. T. Janson. Knowledge of the existance of these bodies only dates back some ten years, whilst general realization of their importance in every-day life is of even more recent date. The lectures gave an interesting account of the researches which have led to present information with respect to these bodies, but they stated that their exact nature is still unknown. Three vitamines are now recognized, all essential to health, and the absence or lack of any one of the three causes specific diseases. "Fat soluble A" vitamine is found in milk, butter, cod liver oil, meats, etc., without it such diseases as rickets, pellagra, etc. develop. "Water soluble B" is found in seeds of plants, eggs of birds, yeast, etc., without this vitamine growth is impossible, and diseases such as beriberi and polyneurites occur. "Water soluble C" or Anti-scorbutic, is found in growing plants, vegetables, citrus fruits, etc. and the lack of this vitamine causes scurvy. It was pointed out that although the varied diet now common in civilized countries almost entirely prevents the occurrence of such diseases as beri-beri, and scurvy, nevertheless there is little doubt that many adults do not get enough vitamines in their diet, and that weakness and susceptibility to other diseases is the result. The need for vitamines in the diet of growing children is, however, a matter of paramount importance, and it is well known that many children have been innocent sufferers in this respect, sometimes even from the excessive care taken by their parents in their diet.

It was shown that although the varied diet now so universal tended to safety from trouble due to lack of vitamines, yet modern methods of manufacture and preparation of foods are often prejudicial to health. Thus, wheat is rich in "water soluble B," but this accessory is absent from white flour. This was strikingly evidenced at the siege of Kut-el-Amara, where

the white troops, fed on white bread, suffered from beri-beri, whilst the native troops fed on bread made from coarse whole meal were immune. All three vitamines, moreover, are, though in varying degree, susceptible to heat. Prolonged cooking, or high temperatures, in general, reduces or destroys the vitamine content of foods. Thus whilst butter, beef suet and many animal fats are rich in fat soluble A, margarine, lard and the vegetable oil preparations now so widely used in cooking, are totally deficient. Slides were shown illustrating some typical cases of vitamine deficiency diseases. Members of the Women's University Club and of the Medical and Surgical Society were present as guests of the chemists, and the papers were followed by a keen discussion

TORONTO SECTION, SOCIETY OF CHEMICAL INDUSTRY.

The January meeting of the Toronto Section, Society of Chemical Industry, can be recorded as one of the best sessions ever held by the Toronto members. The meeting was held Friday evening, January 28th, at Hart House, University of Toronto. There was a splendid attendance, an extremely interesting subject and address, and the dinner that preceded the business of the evening was all that could be desired.

Mr. W. A. P. Schorman of the British-American Oil Company, was the speaker of the evening, giving an illustrated lecture descriptive of the petroleum industry. Four reels of excellent motion pictures entitled "The Story of Petroleum" were shown by Mr. Schorman, these occupying the greater part of the evening and proving most interesting.

In his opening remarks, Mr. Schorman sketched briefly the development of the oil industry on this continent. It was one of the youngest of the large industries, having begun in 1859 when Kere, in the State of Pennsylvania, bottled up the petroleum oil which the Indians sold to him, he in turn placing it in the market as a medicinal oil known as "Seneca Oil," which oil was advertised on the labels to be a "Health Giver" from "Nature's own Springs," etc. Kere, however, continued investigations into petroleum and soon distilled it in order to obtain illuminating oil. This illuminating oil, "Kerosene," was given the name of "coal oil," a name which still remains, from the fact that other illuminating oil obtained prior to "Kerosene" was obtained from coal. The first oil well in America was drilled by Colonel Drake at Titusville, Pa., who founded the first oil company, the Seneca Oil Company. His well was 78 ft. deep and produced 5 barrels per day. In 1920 the State of Oklahoma produced 179,000,000 barrels.

Mr. Schorman paid tribute to the work of the geologist in the oil industry. Until about the year 1885 the geologist was laughed at, but he was an indispensable man today. In 1900 there were only 3 geologists in the State of Oklahoma, today there were over 300 in the service of the oil companies of that State. The geologist was essential to the industry, not so much because he knew where oil could be found (though he was nearly always correct in that) but from the fact that he could tell where oil could not be found, and that knowledge had saved companies hundreds of thousands of dollars in avoiding useless drilling. No better proof of the need of the geologist and what he has already accomplished could be found than from the fact that whereas in 1885 only one well out of 150 was a paying proposition, today one out of every three was a success.

Mr. Schorman dealt particularly with the recent discovery of oil in the extreme north of north-west Canada, and his remarks concerning that discovery were all the more important and unbiased from the fact that it is not the company he is connected with, but another that made the discovery at Fort Norman. From latest reports, Mr. Schorman said, oil is believed to be there in paying quantities, though the operating company has not as yet made public figures concerning probable output. Nature has been particularly kind to Canada with regard to the oil found at Fort Norman, for while the temperature in that territory reaches in winter as low as 60 degrees below zero, yet the oil would flow freely at temperatures below that and did not crystalize until about 90 degrees below zero. This meant that the oil could be transported in pipe lines the year round despite the low temperatures frequently met with. Another extremely important and favorable property of the oil obtained in that territory was that it had a yield of over 50 per cent. in the higher hydrocarbons, giving an excellent supply of gasoline. The credit for the finding of oil in that territory should be given to a Canadian geologist, Mr. Boswell.

Mr. Schorman laid particular stress on the work of the chemist in the oil industry. Many thousands of dollars had been spent on research work in the industry, and many more thousands would yet have to be spent in research. There was today an urgent need for a greater supply of gasoline and it was the province of the chemist to show how this could be obtained. Separation of the higher hydrocarbons by centrifugal force, in a machine working on the principle of the cream separator, was being used by some refineries in conjunction with the distillation process. The critical factor in connection with this machine was the speed, which must be accurately regulated. Here was a field of endeavor and research for the physicist.

The motion pictures were largely self-explanatory, descriptive word films being interspersed among the views. The films depicting the distillation process showing graphically the different distillates rising up from the crude oil and passing "up and out", were a revelation to many of the advances in the art of industrial motion pictures.

Following the address by Mr. Schorman, several members expressed their appreciation of the address, and short remarks were made by Dr. Merchant, Director of Technical Education, Department of Education; Mr. A. Nieghorn, Vice-President of Nichols Chemical Co., and Professor Burt-Gerrans. The chairman, Mr. M. L. Davies called on Mr. C. B. Parsons, President of the British-American Oil Company, who congratulated the Society on its activities and spoke optimistically of Canada becoming a great oil producing country, not only in the northwest, but also in central zones that had not yet been developed or explored for oil.

On motion of Professor E. G. R. Ardagh, a hearty vote of thanks was given to Mr. Schorman. Votes of thanks were also passed to the University for the privilege of using Hart House, and to the Ontario Hydro-Electric Power Commission for the electric projection lantern.

Mr. Davies in opening the meeting referred to the visitors present, including Mr. H. J. Roast, Montreal, Secretary of the Canadian Institute of Chemistry and Mr. S. J. Cook, Ottawa, Secretary of the Ottawa Section, Society of Chemical Industry.

Mr. J. P. Murray brought to the attention of the meeting the proposed building of the National Research Institute at Ottawa, for which the Dominion Government had voted $600,000. He objected to the location of such an institute at Ottawa, believing that it should be built at some industrial centre, similar to Toronto or Montreal. He pointed out that such an institute should be distinctly industrial in character and not academic, and stated that he was sure that the manufacturers would support such an institution. Mr. Davies thought that the plan as outlined by the Government for the Research Institute was commendable, and he did not favor anything that would separate the industries from the universities. "What is needed is that the industries should get closer to the universities and create fellowships" said Mr. Davies.

The arranging of a program for the visit of the British members while in Toronto next summer was referred to the executive committee.

MONTREAL SECTION, SOCIETY OF CHEMICAL INDUSTRY.

The chemistry of pulp making was brought vividly before the members of the Montreal Section, Society of Chemical Industry. at their regular monthly meeting held at the Queen's Hotel, Montreal, Friday evening, January 28th, when Mr. Robert Woodhead of the Canada Paper Company, Windsor Mills, Quebec, gave an excellent address on the "Technology of Wood Cellulose by the Alkali Process and Soda Recovery." Mr. Woodhead's address was illustrated by lantern slides and proved exceedingly interesting and instructive.

QUEEN'S UNIVERSITY FORMS BRANCH OF CANADIAN INSTITUTE OF CHEMISTRY.

A branch of the Canadian Institute of Chemistry has been formed at Queen's University, Kingston. On Monday, January 31st, an organization meeting was held. Queen's should be recognized as a leader among Canadian universities in the matter of organizing students in chemistry under the new student membership regulations of the Institute. No time was lost following the meeting of the Council of the Institute on January 28th at Toronto when the question of student membership was officially passed.

New members elected to Canadian Institute of Chemistry:—
FELLOW—George P. Allen, Esq.,
P. O. Box 165,
James Island, B. C.
ASSOCIATE—James Hossack, Esq.,
40 Waller St.,
Ottawa, Ont.

OBITUARY

DEATH OF P. H. WALSH, F.C.S., PROMINENT DYER AND TEXTILE CHEMIST.

On December 28th, at Homeopathic Hospital, Montreal, the death occurred of Mr. P. H. Walsh, F.C.S. Mr. Walsh was 64 years of age and unmarried. He came over from England many years ago to take a position with the Dominion Textile Co., Ltd., and was located at Magog, Quebec. He was a real specialist in textile chemistry, and had some considerable experience in the soap-making business. Perhaps the most notable work that he accomplished was that of the preparation of specially satisfactory gun cotton for use in the preparation of explosives. His work in this connection was recognized by Woolwich Arsenal, and fully investigated by representatives of the Government who came to Canada for that purpose.

His personal qualities of refinement were quite marked. He was a more than ordinary musician and one of his chief pleasures was to hear all musical treats each season. His interest in his fellow workmen in the field of science was considerable. He had a keen sense of the value of technical organization, and was a member of the Canadian Instutute of Chemistry from the beginning, making a very generous subscription to the initial funds of the Society. He was buried at Magog, where he had worked for the last twenty years. Among many other floral wreaths was one from his fellow members in the Canadian Institute of Chemistry.

LARGE CAPITAL INVESTED IN CANADIAN CHEMICAL INDUSTRIES

The Dominion Bureau of Statistics, Ottawa, has prepared a general review of the statistics of the manufacturing industries of Canada for the calendar year 1918. The review shows that the amount of capital invested in the chemical and drug manufacturing industry was $26,029,530; number of employees, 4,292; salaries and wages, $5,872,947; value of products $38,252,-587. The amount of capital invested in the electric light and power industry was the largest, $401,942,402 being invested in this industry, this exclusive of the electrical apparatus and supplies industry, which is ranked as a separate industry and in which the sum of $43,285,405 was invested. The pulp and paper industry comes second for capital with $241,341,704 invested in it, with 25,863 employees, wages and salaries amounting to $26,974,226, and the value of its products at $119,309,434. In the value of products the flour and grist mill industry ranks first, its products for the year being valued at $262,537,122. The slaughtering and meat packing industry comes second as regards value of products, these amounting to $229,231,666. The value of the product "Electricity" of the light and power industry, valued at the plants, is $53,449,133. The steel rolling mills and steel furnaces industry is an important one, the large amount of $109,535,103 being invested therein with 20,047 employees, a wage bill of $27,653,972 and the value of its products placed at $209,706,319.

While compared with these extremely large industries the chemical industry in Canada does not appear to be large, yet in the list of the thirty leading industries of the Dominion prepared by the bureau, in order of the value of their products, the chemical industry ranks 20th.

SOCIETY CALENDAR.

Canadian Institute of Mining and Metallurgy—Annual General Meeting to be held at the Chateau Laurier, Ottawa, March 2nd; 3rd; and 4th, 1921. R. R. Rose, Assistant Secretary, 503-504, Drummond Bldg., Montreal, Que.

American Electro-Chemical Society.—39th General Meeting to be held at Atlantic City, April 21st., 22nd. and 23rd., 1921. Secretary, Jos. W. Richards, Lehigh University, Bethlehem, Pa.

AMERICAN ELECTRO CHEMICAL SOCIETY.

The 39th General Meeting of the American Electro-chemical Society to be held at Atlantic City, April 21-23, 1921, will be an assured success from the standpoint of papers and discussions. A symposium on Corrosion of Metals will be participated in by several of the leading lights on this topic; electro furnaces will occupy at least one session and several other papers on timely topics are in preparation.

JACK PINE SUITABLE FOR PULP MAKING.

Not many years ago, spruce was considered the only wood suitable for making pulp. Gradually , and, with much opposition, balsam was admitted in mixture with spruce until today it is accepted in almost unlimited quantites. And now the long-despised jack pine has been under the scrutiny of the research departments of several of the progressive pulp and paper companies, who have established the fact that it is quite feasible to use jack pine in either the sulphite or groundwood processes of pulp manufacture.

At the instance of the Wayagamack Pulp & Paper Co., Ltd., of Three Rivers, Arthur D. Little, Inc., carried on some investigations in their laboratories. They report that the fibres of jack pine are longer than the fibres of spruce, and that the amount of fats, resins and waxes, hitherto assumed to be prejudicial, is not sufficient to preclude its use as sulphite pulp. It appears to require, however, a stronger acid and a longer cooking than other species, and must, therefore, be manufactured separately. In the mechanical or groundwood process, it is claimed that it will make just as good, if not better, pulp than any on the market.

Many other kinds of wood, including poplar, birch and hemlock, can be used in the pulp and paper industry, and it is hoped that further research will result in their more general utilization for this purpose.

A NEW COMBUSTION CONTROL INSTRUMENT.

The Mono Corporation are placing a new instrument on the market for CO_2 measurements. It is designed to show the presence of combustible gases in flue gas and operates by a dual system of measurement. The apparatus is driven by water pressure of about ten pounds per square inch. The gas samples from the flue are pulled through a filtering system to remove soot and dirt. A mercury piston forces them through the system. Samples pass alternately through two routes: one leading directly through caustic potash tank where CO_2 is absorbed, and the other first through an electrically heated furnace wherein the combustible gases are oxidized to CO_2 and H_2O and then through the caustic potash tank. The first samples give CO_2 readings only: those that are oxidized give CO_2 plus combustible gases, and the difference between these readings is proportional to combustible gases present at the time of analysis.

The oxygen necessary to oxidize the combustible gases CO CH_4 and H_2 to CO_2 and H_2O is taken from the air almost invariably present in flue gases, even when combustible gases are present. If there is not sufficient air, oxygen is taken from copper oxide placed in the furnace. In practice the copper oxide is seldon reduced. These measurements are recorded on a chart with a lag between measurement and indication of about three minutes where the distance between instrument and point of flue tapping is about 60 ft. and when instrument is making forty analyses per hour. Instruments are made covering a range of 20%. 25% or 40%.

In general, readings indicating presence of combustible gases, are exaggerated slightly. This is some advantage as the aim of firing is to avoid combustible gases. The amount of combustible gases and the CO_2 present at the time is given which when properly interpreted for given conditions is valuable and necessary information.

The critical point of a furnace system may thus be determined and is the highest percentage of CO_2 that can be reached in a given furnace without having combustible gases begin to appear. The higher this can be raised, the more economical is the process.

It will be noted that when the oxygen used to oxidize CO; CH_4 and H_2 comes from copper oxide no volume changes other than the removal of these gases takes place. When oxygen from flue gas is used three volumes of CO_2 form from two volumes of CO. In cases of CH_4 three volumes of gas are removed from the sample for one volume of methane. In case of hydrogen three volumes of gas are removed for each two volumes of hydrogen.

CHEMISTS HONOR WILLIS R. WHITNEY

In recognition of the many inventions through which he had applied chemistry to the service of mankind, Dr. Willis R. Whitney has received the Perkins Medal.

The medal is given for the highest achievement in applied chemistry and is named for Sir William Perkin, the distinguished British chemist, the discoverer of the first processes for the manufacture of aniline dyes from coal tar. The presentation was made at Rumford Hall, 50 East 41st Street, New York, January 14, by the American Section of the Society of Chemical Industry, The American Chemical Society participating in the award.

To the general public Dr. Whitney is best identified through his work in perfecting a detector for giving warning of the approach of submarines, which was put into practical application during the European War at the Nahant Station of the United States Navy. As a member of the Naval Consulting Board, he did much for the development of radio telephony and radio telegraphy while the conflict with Germany was in progress.

From a professional point of view, his most notable achievement was the creation and promotion of the Research Laboratory of the General Electric Company at Schnectady, New York, which was one of the earliest applications of organized research to industry. In electric lighting the first radical improvement in the carbon incandescent filament since Edison was due to the personal work of Dr. Whitney. He devised a filament which had a new form of carbon which gave 25 per cent. more light for the same wattage than the standard carbon filament lamp.

Dr. Whitney also did valuable work in the development of the use of wrought tungsten for electric light filaments and also aided in perfecting the gas filled electric globes. Among other investigations made by him have been the study of the laws of heat conducton and radiation, the dissociation of gases at high temperatures and the transformation of other forms of carbon into graphite.

RESEARCH GRADUATE ASSISTANTSHIPS, UNIVERSITY OF ILLINOIS

There will be thirteen vacancies to be filled for the Research Graduate Assistantships maintained by the Engineering Experiment Station of the University of Illinois. In addition to these, there will also be two vacancies in Gas Engineering. Applications for appointments to these positions should be sent to C. R. Richards, Dean and Director of the College of Engineering of the University by March 1, 1921. Going with each assistantship is an annual stipend of $600. and freedom from all fees except the marticulation and diploma fees. The assistantships are open to graduates of approved American and foreign universities and technical schools who are prepared to undertake graduate study in engineering, physics, or applied chemistry. The appointments are made and must be accepted for two years, at the expiration of which period, all requirements having been met, the degree of Master of Science will be conferred. Nominations are based upon the character, scholastic attainments and promise of success in the principal line of study or research to which the candidate proposes to devote himself. Preference is given those applicants who have had some practical engineering experience following the completion of their undergraduate work.

DEVELOPMENT OF SALT DEPOSITS AT MALAGASH, NOVA SCOTIA

These deposits originally located by Peter Murray in 1912 on his farm at Malagash, are now being gradually developed by the firm of Chambers & MacKay, New Glasgow, N.S. They undertook their development work in 1917 following reports by Messrs. L. H. Cole and Dr. A. W. Wilson of the Mines Branch, Ottawa. After three years' testing and developing, it is now known that Nova Scotia has sufficient salt to supply her own needs, and has good prospects for the development of a salt industry. The salt is low in magnesia and in quantity runs 97.5% NaCl. The potash content seems to be well worth considering. L. C. Harlow of the Agricultural College, Truro, N.S. has done some work on a fertilizer salt taken from beds showing content of potash 1.1%. The amount of potash was small, and as from two hundred to three hundred pounds of the salt were used per acre, it is hardly correct to consider variations in the crop to be due to anything other than the use of the sodium compound on the soil used. The addition of salt seemed beneficial. It is hoped that a fertilizer salt will be available eventually from these deposits containing a much higher percentage of soluble potash.

Ferdinand Schlesinger, head of the Newport Chemical Co., Milwaukee, Wis., died suddenly at Albuquerque, N.M., at the age of seventy. He was on his way to Pasadena, Cal., accompanied by his wife and son. Mr. Schlesinger was chairman of the board of directors of the Milwaukee Coke & Gas Co. and the Steel Tube Co. of America.

BOOK REVIEWS

FURTHER NOTES ON "PLANTATION RUBBER AND TESTING OF RUBBER".

A brief notice of this book appeared in our December number. The author is Prof. Whitby of McGill University, Department of Chemistry. He was for some years Chief Chemist to one of the larger groups of rubber producers in Malaya and is thus well qualified to discuss the production and testing of plantation rubber. With this in mind, the material in the first portion of the book dealing with the preparation of plantation rubber and its technology will be received with confidence as it relates to much practical experience and extensive research.

The book has received very favorable attention by reviewers reporting to various scientific journals. The general opinion is that the work is quite up-to-date, and is a distinct contribution to the book literature of rubber. The accounts given of research work accomplished and the general bibliography included, are pointed out as prominent valuable features. Canada has several men in her rubber industries whose work is well-known internationally, and it is a pleasure for this journal to be able to congratulate a member of the chemical profession and the staff of one of our leading universities on the production of such a work.

"ORGANIC MEDICINAL CHEMICALS."

By M. Barrowcliff and Francis H. Carr, Bailliere, Tindall and Cox, London. Westman Press, Ltd., Toronto. 331 pp. Price, $4.00.

The literature relating to the manufacture of organic medicinal chemicals has remained for the most part, in its original form. The reduction of the same to book form has not been rapid. These authors have had a very excellent opportunity, and as is not always the case, they are dealing with a field in which they have contributed much to original literature and developments in practice.

Chemicals are dealt with according to their therapeutic uses. Some things are not given in detail, but in general, a fund of most valuable manufacturing information is placed in good order. Some 24 illustrations give concrete ideas of arrangement of apparatus and equipment in a variety of processes. The classifications used in the treatment relate to the manufacturing of:

1. Narcotics and general anaesthetics.
2. Naturally occurring alkaloids and their derivatives.
3. Natural and synthetic local anaesthetics.
4. Antipyretics and analgesics.
5. Organic antiseptics and disinfectants.
6. Purgatives.
7. Vaso-constrictors and vaso-dilators.
8. Diuretics and uric acid solvents.
9. Organo-metallic compounds.
10. The digitalis group, skin irritants, glucosides and neutral principles.
11. Other substances of interest, pituitary and thyroid extracts, thyroxin, vitamines, saccharin.

"A DICTIONARY OF CHEMICAL TERMS."

By James F. Couch; D. Van Nostrand Co., New York. 203 pp. Price, $2.50 U.S.A.

Chemical dictionaries of one type and another are on the increase. They are useful additions to libraries and, like hand books, are great memory stimulators, specially useful to those who have no particular reason for remembering facts beyond the point of where to locate them when needed.

Each reader will look at such a book from his own angle. Those whose business it is to define closely certain terms may not be satisfied with some of the definitions given. For example a "Mixture" is defined as "a heterogeneous aggregation of materials as distinguished from a chemical compound. The constituents of a mixture may be separated by simple mechanical means, those of a chemical compound cannot be so separated." This conception is crude and hardly worthy of consideration. The chief thing about a mixture seems to be that the substances retain their original properties. The introduction of mechanical means or other means of separation is uncalled for in such a definition. The mere elevation of temperature is, for example, a much easier process than it would be to find some "Simple" mechanical means for separating some half dozen different chemicals in the form of fine dust well distributed throughout a good solid tar.

In the interests of the development of an exact language for chemistry, the greatest care is necessary in the making of definitions. Mossy, childlike conceptions of this kind should not pose longer as representative of the definitions of modern chemistry. Where the track is straight and narrow the author has recorded the usual information.

"APPLICATION OF DYESTUFFS TO TEXTILES, PAPER, LEATHER and OTHER MATERIALS.

By G. Merritt Matthews, Ph.D., 768 pp., 303 illustrations. $10.00 U.S.A. John Wiley & Sons, Inc., New York.

The field covered in this excellent work may be judged by the titles of the chapters rather than from the main title.

Chapter 1—Chemical study of the fibres.
" 2—Scouring the textile fibres.
" 3—Bleaching of wool and silk.
" 4—Bleaching of cotton.
" 5—Classification of dyes.
" 6—Application of acid dyes to wool.
" 7—Application of acid dyes to silk, cotton, etc.
" 8—Representative acid dyes.
" 9—Stripping of colors; testing fastness of dyes.
" 10—Application of basic dyes.
" 11—Basic dyes on cotton.
" 12—Principal basic dyes.
" 13—Application of substantive dyes to cotton.
" 14—Substantive dyes on wool and silk.
" 15—Developed dyes on cotton and silk.
" 16—Application of mordant dyes.
" 17—Sulphur dyes.
" 18—The vat dyes.
" 19—Aniline black.
" 20—Use of logwood in dyeing.
" 21—The minor natural dyes.
" 22—The mineral dyestuffs.
" 23—Dyeing of fabrics containing mixed fibres.
" 24—Application of dyes to minor vegetable fibres: linen, ramie, hemp, jute, and artificial silk.
" 25—Theory of dyeing.
" 26—Testing the fastness of colors.
" 27—Application of dyes to various materials.
" 28—Application of dyestuffs in the preparation of lakes, inks, etc.
" 29—Testing of dyestuffs.
" 30—Miscellaneous tests in dyeing.
" 31—Chemical reactions of dyestuffs.
" 32—Analysis of textile fabrics.
" 33—Useful data for dyers and textile chemists.
—Bibliography.
—Indices.

"Application of Dyestuffs" is a title which does not adequately describe the contents of this book, for scouring, bleaching, analysis of fabrics, etc., are treated with almost as much detail as the process of dyeing. The preface states this volume "is

a more extended development of the author's earlier book entitled 'Laboratory Manual of Dyeing and Textile Chemistry".

An introduction is given which contains an historical review of the development of the art of dyeing, use of colors and pigments and a comparison of the colors used in ancient times with those employed in modern practise.

Dr. Matthews has guarded himself against possible criticism of chapters 8 and 12, and parts of chapters 13, 15, 16 and 17, which contain lists of representative dyes by stating that "there is considerable chaos in the dyestuff world and there has also been considerable readjustment in the naming of dyestuffs". It is exceedingly unfortunate that up to the present time no really good workable standard nomenclature for dyestuffs has been devised. Each manufacturer who gives his dye products new names, most of which mean little or nothing, only adds to the confusion. For instance, the data in chapter 23 on (a) acid dyes not dyeing the silk in boiling acid bath, (b) acid dyes not dyeing the wool in cold acid bath, (d) substantive dyes dyeing silk and wool alike, (f) basic dyes for shading the silk, not dyeing the wool, etc., would be vastly more valuable to the dyer and color chemist if a standard system of nomenclature were in use.

The reviewer is of the opinion that since two chapters have been devoted to the bleaching of wool, silk and cotton, some mention should have been made of the bleaching of linen and jute. Stimulus to research on the bleaching of these two fibres is badly needed, for the methods now in use are antiquated and there is much room for improvement.

The application of dyestuffs to textiles naturally receives major attention. The methods in use are fully elaborated. Difficulties likely to be met are dealt with in a constructive manner, and comparisons are made whenever several ways of conducting an operation are possible. Dyeing in all branches of textile activity is treated in a clear concise way.

The application of dyestuffs to leather, paper and other materials other than textiles is briefly treated, perhaps too brief to be of much value to those actually engaged in coloring such substances. The student and others who are interested however, will find such an outline of interest as well as a preliminary introduction to the subject.

No book on dyestuffs would be complete without reference to the Natural Dyes and in the book under review, logwood is fully dealt with. The chapter on the minor Natural Dyestuffs is good reading for those interested in colors. The intensive research of the organic chemist has driven most of nature's coloring matters from the field of textile operations and now some of their names are almost forgotten.

While this book is primarily intended for the use of the student, it contains very much that is of interest and value to the dyer and chemist who is employed in the industries using dyestuffs. One cannot help commenting on the large number (303) of excellent illustrations of all types of machinery used in the scouring bleaching, dyeing and finishing of textiles. Every textile laboratory library should have a copy on its shelves, and no dyer can afford to neglect using such a book. W. A. L.

CANADA LARGEST BUYER OF AMERICAN OIL

During the first ten months of 1920 the United States exported 36,130,572 short tons of coal, valued at $283,737,599. Of this tonnage 31,517,001 tons was bituminous and 4,613,568 tons was anthracite.

The largest purchasers of American coal during the past 10 months were Canada, which imported 17,331,323 short tons, and France, which imported 3,068,456 short tons, followed by Italy, Netherlands, Argentina, Sweden, Cuba, Denmark, Brazil, Switzerland, Norway, and Egypt, in the order named, each of which has imported more than 500,000 short tons. The exports during the first 10 months of 1920 are at the rate of about 43,000,000 tons per annum.

ANNUAL MEETING OF ENGINEERING INSTITUTE OF CANADA.

The Thirty-fifth Annual, General and Professional Meeting of the Engineering Institute of Canada was held at the King Edward Hotel, Toronto, February 1st, 2nd and 3rd. A very large attendance of members was in evidence, and a most successful year was reported. The activities of the Institute in general are expanding. For Ontario, the question of legislation relating to professional engineers has been developed. General business was handled on Tuesday. Professional meetings were held on Wednesday morning and on Thursday.

Papers given before the new Chemical Section under the chairmanship of T. L. Crossley were:—"Chemical Engineering in the Packing House," by J. R. Donald; "Hydrated lime, a Chemical Engineering Product," by Lucius E. Allen.

The establishment of this section is an evidence of the larger place chemical engineering problems are finding in the work of the Institute.

Excursions were arranged for Baldwin's Canadian Steel Plant, Electrical and Structural Laboratory of Hydro-Electric Power Commission of Ontario, Provincial Board of Health Experimental Station, City Waterworks Pumping Station, Filtration and Disposal Plants.

Mr. J. M. R. Fairbairn succeeds Mr. R. A. Ross as President of the Institute.

JOINT MEETING OF PAINT & VARNISH SUPERINTENDENTS AND TORONTO PAINT CLUB.

On January 5th, over fifty representatives of Paint and Varnish industries in Toronto, heard Dr. Henry Gardner, Director of Research for paint and varnish manufacturers association of the United States, speak on problems and new activities in these industries.

A dinner was given at the Engineers' Club in connection with the meeting. Dr. Gardner introduced his address by presenting those present with a summary of bulking value tables of pigments and liquids used in paint and enamel manufacture. Numbers are based, on all industrial samples available and averages for twenty samples taken. For example: for basic carbonate white lead, sp. gr. 6.81 weight per solid U.S. gallon 56.73; one pound bulks U.S. gallon 0.01763; one pound bulks British gallon, 0.01468. The factor used in converting the U.S. standard to British Imperial gallon is 0.8327. By such tables very accurate estimations may be made in advance on large batches.

A few of the points taken up, both in connection with the business end of manufacturing and the research work on hand, may be mentioned. It was stated that one of the most needed influences in many plants was a proper cost accounting system. Manufacturers should meet modern methods of buying to specification as practised by railroads, the government, and other large buyers. Cases where quotations had varied on a certain paint from $1.88 to $4.03 per gallon, were given as examples of the need of better methods in cost accounting. The introduction of a general poundage basis is most desirable as this unit is fair under all circumstances and at one stroke does away with the confusion arising from different volume units and temperature changes.

Some idea of the increase in use of paints due to the operation of spray painting machines was outlined. It was maintained that this was new business and not injurious to hand labor. Many rural places have community painting apparatus, allowing painters to cover much more work in one season. In spray painting, 8 to 10% greater thickness in film is obtained, making necessary the use of a rapid drying oil. The introduction of "Mill Whites" has greatly expanded the use of this class of paints in factories. A perfect reflection or, maximum possible amounts to about 88% of light entering. Magnesium oxide will do this

An average Mill White paint will give 66% to 71% of total possible reflection. An unpainted brick gives 12%. In this way the lighting bill may be cut one half. A lithopone-zinc oxide paint in 3 to 1 amounts, makes about the best light reflecting paint. Lead is about 2% less.

An effort is being made to cultivate the tung oil tree in America. China wood oil from the small plantations started, shows the highest quality.

It is a question if the American farmer will be content with the rather small yield or cash return per acre. Some 20,000 trees are planted in Ameiica and yield about $40 per acre after five years. A relative new oil, Chia oil, is being studied. It comes from plants growing naturally in Mexico, and is much like linseed oil from the chemical standpoint.

The use of suitable varnish lime was urged. It was found that high magnesia content ruined the lime for varnish purposes. Both titanium paints in America and white oxide of antimony paints in England were being developed at the moment. Dr. Gardner pointed out that the paint and varnish industries were not only finding larger uses for their products but were continually using new materials whose properties for specific work were becoming better known, and developed through research and observation.

A fine discussion followed in which individual questions were taken up fully by the speaker.

PHYSICAL CHARACTERISTICS AND USES OF TRIPOLI AND DIATOMACEOUS EARTH.

Following the early confusion of names, the term "tripoli" is being reserved for the type of material found at Seneca, Missouri, as far as the United States is concerned. Diatomaceous earth (or synonyms, infusorial earth, Kieselguhr), properly refers to siliceous material of organic origin, containing diatoms. Pure tripoli is a white, granular, porous, siliceous rock, derived from the decomposition of chert, or siliceous limestone. Most grains are less than 0.01 m.m. in diameter. Diatomaceous earth is a soft, porous rock, composed of the siliceous skeletons of aquatic plants, called diatoms, of which some 4,000 distinct forms have been noted.

Pure tripoli will run 98% SiO_2, while diatomaceous earth will run slightly less than 90% SiO_2, containing 5% water. Diatomaceous earth, when pure and dry, will have an apparent specific gravity less than one. Tripoli will sink in water. Under the microscope, tripoli shows rounded grains, while diatomaceous earth shows shell-like structure.

Uses of Tripoli.

Tripoli may be colored with iron, Massive tripoli is used for the manufacture of filters. Disks of various sizes have been used largely in small filtration plants, and are very efficient. Extraction thimbles and Gooch filters have been turned from tripoli. Tripoli flour makes a mild abrasive, and is an ingredient of scouring soaps. A considerable amount of ground tripoli is used as a parting sand for molds in iron foundries. It is largely used as a paint filler, and as such is marketed as "Silica". The finest air floated dust is used as a filler for rubber. Prices range from $9 to $50 per ton, with an average of about $12.

R. B. Ladco, U.S. Bureau of Mines Report, Serial No. 2190. November, 1920.

"Physics-Engineering" Course For Toronto. University

As a result of the Physics Conference held at Toronto University in January under the direction of Professor J. C. McLennan, it is practically decided to establish a new course at the University to be known as that of "Physics-Engineering." The instruction to be divided between the physics department of the Faculty of Arts and the Chemical and electrical departments of the Faculty of Applied Science, thus combining the theoretical and practical sides of the field of physics. Such a course, it is contemplated, would enable a graduate to occupy professorial chairs at the universities or of carrying on practical work in the industrial world.

Another development from the conference has been the proposal to establish a Canadian Institute of Physics, in activities similar to the Royal Society of England.

U.S. GOVERNMENT FAILS TO PROVE SACCHARINE HARMFUL.

For some time past, a controversy has been going on in the United States regarding the use of saccharine, culminating in a suit against the Monsanto Chemical Works, St. Louis, Mo. This suit came to trial in the Fall of 1919. The Government charged that the statements on the labels of the Monsanto Company were false and misleading, in that the company claimed that saccharine was—1, Healthful; 2, A perfect sweetner; 3, Positively harmless. The Court dismissed the first two counts and the jury disagreed on the third. The Monsanto Company then requested the Court to proceed at once with another trial so as to get the question—if any—regarding (3), the harmlessness of saccharine, definitely settled. The Government's attorneys declined, and although over a year has elapsed since the trial, the case has not yet come up for trial again. The matter has again attracted public interest, however, by the action of the Bureau of Chemistry, of the United States Department of Agriculture, in preparing a digest of the testimony of the Government witnesses at the trial, and sending copies of the same to all State and Municipal Food and Drug officers. No mention is made in this digest of the testimony offered by witnesses for the Monsanto Company, and in view of this, the Monsanto Company have prepared a digest of the testimony offered by both sides which makes very interesting reading and from which, one can readily understand why the jury refused to declare that saccharine is a harmful drug. It is well to remember, that the Referee Board of Consulting Scientific Experts in their report on saccharine, during the Roosevelt administration, could not find wherein saccharine was harmful to the human being.

ENGINEERING LEGISLATION FOR ONTARIO.

The Advisory Conference Committee on Engineering Legislation was organized to consider the question of engineering legislation for Ontario and represented the different well-known classes of engineers and chemists operating in the province. Meetings were held during the past year and attended by representatives of all concerned. Most of the organizations have reported favoiably on the principle of the legislation. There being no representative Ontario organization cf chemists, it was more difficult to operate and at a conference of chemists available, held in Toronto on January 14th., proposed legislation was discussed, and approved in principle as far as it relates to Chemists, Chemical Engineers, and Consulting Analysts. By this proposed legislation all chemists will become Registered Professional Engineers if they wish to initiate and control chemical work.

Professional Engineering is defined, as far as it relates to chemical operations, as the advising on, the reporting on, the designing of, the supervising of, the construction of, the appraisal of, chemical and metallurgical machinery, apparatus and processes. This is understood to include all branches of chemical work.

The bill provides all the necessary machinery for the operation of a council, registration, licensing, fees, penalties, etc. Each branch of engineering will have the same number of representatives, and those members of the council connected with that branch will be responsible for the admission of members in their own field.

The main features of the proposed bill are as follows:—

1. It follows closely along the lines of legislation already enacted in the Provinces of British Columbia, Alberta,

Manitoba, Quebec, New Brunswick and Nova Scotia. For this reason reciprocal privileges between these provinces and our own should be much easier than if our legislation were along radically different lines.

2. It places the control of engineering in the hands of the profession itself, thereby avoiding control by Government officials who may lack full understanding of our diversified needs.

3. The Government will have a share in choosing the personnel of the Council, thus providing a guarantee that the Council cannot be controlled by any particular group.

4. The different branches of engineering are given equal representation, so that no one branch can gain control.

5. The branches are made partially autonomous, so that their regulations may vary from one another in matters requiring such variation. At the same time the Council has power to prevent these variations becoming too extreme.

6. The legislation is intended to cover engineering only. Technical trades and similar occupations cannot be brought within its scope. It is only by remaining distinct from these that engineering can attain full professional status.

7. Provisions for registration of present practicing engineers are made reasonably broad, so that nobody with fair pretensions will be debarred from his present livelihood.

MINING AND METALLURGY IN BRITISH COLUMBIA.

(Special Correspondence to Canadian Chemistry and Metallurgy)

Mineral Production, 1920.

On January 18, the Provincial Department of Mines issued the Preliminary Review and Estimate of the Mineral Production of British Columbia, for 1920. This report is issued each year with the object of placing before the public an approximate estimate of the mineral production, without waiting for the actual returns from the various mines and smelters, and it is understood, of course, that the figures are only an estimate and are subject to revision in the final report that usually comes out some time in June. The following is the estimate for last year, side by side with which is printed the production for 1919, so that a comparison between the two years may be made:

conversion of a number of the C. P. R. oil-burning locomotives into coal burners. A number of the coastwise steamers and many industrial plants have had to make similar alterations.

There has been a marked increase in the output of zinc due to the development and increased output of the Consolidated Mining & Smelting Company's Sullivan mine, at Kimberley, but it is difficult to see how the Provincial Mineralogist arrived at his zinc figures for both 1919 and 1920, unless they are based on the assay value of the ore produced. This, of course, palpably would be unfair, as in many instances the zinc in the ore is not recovered at all, and it is doubtful whether more than 80 per cent. of the zinc content is recovered from any of the ore mined. The Consolidated M. & S. Co. is responsible for between 80 and 90 per cent. of the zinc produced in British Columbia. For the 15 months ended December 31, 1919, the Company produced 30,743,416 lb. of zinc, which would place the 12-months' production at about 26,000,000 lb

The Company has announced its production for 1920, (with the month of December estimated), at 37,131,000 lb. Instead of being between 80 and 90 per cent. of the zinc production of the Province, it will be seen that in neither year does it amount to 50 per cent. of the Provincial Mineralogist's figures. Mr. John McLeish, statistician for the Dominion Department of Mines, makes his figures for the zinc production of Canada about four to five million pounds more than the Consolidated Company's figures, and when the zinc ore that is smelted outside the Dominion is taken into consideration, it would make Mr. McLeish's figures about accurate, and it seems a pity that the Provincial figures are not made to agree with them, and thus avoid confusion.

It will be noticed from the table that the fluctuation in the metal market has produced some curious anomalies; thus, for example, the quantity of both copper and silver produced in 1920 is greater than that produced in 1919, but the value is less; on the other hand less lead was produced in 1920, but it had a greater value than the 1919 production.

As was to be expected, the gold output shows a decrease, for is it not so all over the world, except in the one favored spot, Ontario? The silver production in the Slocan and Slocan City districts, which hitherto have been considered to be the silver districts of British Columbia, shows a marked decrease.

	Production, 1919.		Estimated Production, 1920.			
	Quantity.	Value.	Quantity.	Value.	Increase.	Decrease.
Gold, placer .... oz	14,325	$ 286,500	13,250	$ 265,000	....	$ 21,500
Gold, lode .... oz.	152,426	3,150,645	118,176176	2,442,698	....	707,947
Total gold	....	3,437,145	....	2,707,698	....	729,447
Silver .... oz.	3,403,119	3,592,673	3,401,926	3,265,324	....	327,349
Copper .... lb.	42,459,339	7,939,896	42,773,660	7,485,390	....	454,506
Lead .... lb....	29,475,968	1,526,855	21,545,047	1,540,471	$ 13,616	....
Zinc .... lb..	56,737,651	3,540,429	76,765,268	5,143,272	1,602,843	....
Total metalliferous	....	20,036,998	....	20,142,155	105,157	....
Coal .... tons, 2,240 lb.	2,267,541	11,337,705	2,712,228	13,561,140	2,223,435	....
Coke .... tons, 2,240 lb.	91,138	637,966	68,190	477,330	....	160,636
Total collieries	....	11,975,671	....	14,038,470	2,062,799	....
Miscellaneous and building material	....	1,283,644	....	1,400,000	116,356	....
Total production	....	33,296,313	....	35,580,625	2,284,312	....

It will be seen that the value of the estimated production for last year shows an increase of $2,284,312 over the production of 1919, and that increase is due almost exclusively to increased production of coal and zinc. The increase in production of coal has been due very largely to the shortage of fuel-oil during the latter part of the year; a shortage that has necessitated the

But increase in production in the Skeena district, which includes the Dolly Vardon and Premier mines, has more than made up for the deficit in the Slocan, and the whole Province shows a slight increase in quantity produced. The out-put of non-metallics, though it shows a slight increase, is disappointing, and goes to show that the Canadian West has not yet properly

started on reconstruction after the four-years' period of war. Of the non-metallics the clay products show the greatest advance, and these have been shipped as far east as Quebec and as far south as San Francisco.

Copper Production at Granby.

With the commencement of the year the Granby Consolidated Mining Smelting & Power Company instituted a cut of 75 cents per day in wages, which the miners and smelter men have accepted in preference to a shut down—the alternative offered them. Despite the laying-off of some of 300 men, the Granby Company is producing at the rate of two and three-quarter million pounds of copper per month, which is a greater rate than at any time during the past eighteen months. This has been the cause of putting the company's shares up about ten points. The Consolidated M. & S. Co. has cut day wages 55 cents and monthly wages $15. The company has notified individual mine owners that, owing to the large stock of metals on hand, it no longer is able to finance them, and can give only warehouse receipts for metal extracted from custom ores. As freight rates prohibit shipment from the interior mines to smelters in the United States, it is feared that a number of the small owners will be forced to close their mines.

The boards of trade of several cities in the Province have asked for an inquiry into the prices of coal, which in Victoria and Vancouver amounts to $13 to $15 per ton. As a number of the colliery owners have made wage agreements that do not expire until the end of next year, it is difficult to see what can be done, unless the middlemen are profiteering, which seems likely, as it will be seen from the table that the Provincial Mineralogist has valued coal at $5 per ton at the pit's mouth.

Notes From the Mining Companies.

The Tidewater Copper Co., which made its initial shipment of 400 tons of concentrate to the Tacoma smelter in December, has ceased production, but is continuing development work at the mine.

The Taylor Mining Co. has closed the Dolly Varden mine entirely for the winter. It had been intended to continue both mining and development work, but the directors believe that labor will be cheaper and more abundant in the spring, and as labor handed them a rather "raw deal" in the spring they evidently have reciprocated in kind.

Shipping has commenced from the Premier mine, and already 850 tons, averaging $400 per ton, has been sent to the Tacoma smelter. A survey has been made for an aerial tramway, 14 miles long, between the mine and tide-water, and when this is completed it will make shipping possible from the Premier throughout the year.

The Algunican Development Co. will ship about 100 tons of very high-grade silver ore, running into the thousands of ounces per ton, from the Spider group, in the Salmon River district, during the winter. This will make the second shipping mine in the district.

Mayor Gale, of Vancouver, announced at the first meeting of the new city council that he was authorized to state that British capital would commence operation on an iron and steel plant in the vicinity of Vancouver within the present year.

British Columbia Industrial Notes.

The Prince Rupert Paper & Pulp Company has been incorporated with a capital of $4,000,000 and head office in Vancouver. The new concern proposes to erect a large plant at or near Prince Rupert, and will manufacture wood pulp in conjunction with a general lumber business.

Henning Helin has been appointed general manager of the Western Canada Pulp & Paper Co. Mr. Helin is well-known throughout the Dominion, having been technical manager for the Wayagamack Pulp & Paper Co. for some six years. H. J. Daly has been appointed president of the company to succeed E. M. Davis. The company's plant, which is situated at Port Mellon, about 30 miles north of Vancouver, has a capacity of 40 tons of pulp per day and will be put into operation early in February.

At a meeting of the employees of the Granby Consolidated M.S.& P.Co., it was decided by a vote of 750 to 175 to accept the wage reduction of 75 cents per day. The new wage scale came into effect on January 1, and is to remain in force for three months, at the end of which time the matter will be taken up again. In putting the reduction before the men, H. S. Munroe, the general manager of the company, told them that the company could not produce copper profitably under the existing wage-scale, while the price of copper remained below 15 cents, and that in the event of their refusing to accept the new scale the plant would be shut down. The men were given a week to think and talk the matter over. Many of the men have been in the company's employ for nearly 20 years, and have comfortable homes, in fact, it has always been the policy of the company to see that the men are well housed and provided with proper recreation.

The Tidewater Copper Company made a consignment of 400 tons of concrete recently to the Tacoma smelter. The consignment is valued at $25,000. This is the first shipment that the company has made; it has been operating the property at Sidney Inlet, on the west coast of Vancouver Island, for the past three years, and is said to have spent $650,000 in development and equipment. About 125 men are employed. The mine and concentrator is run entirely by water power, consequently is able to operate cheaply; in fact, it is claimed that copper can be produced profitably even at the present price of the metal. Sufficient ore has been developed to keep the plant running for ten years at its present capacity.

The Harrison Lumber & Pulp Company, with a capital of $15,000,000 has been granted provisional registration. The new company is headed by Sir Douglas Cameron and the Rat Portage Lumber Company, and will shortly erect a mill with a capacity of 60 tons of "kraft" paper daily at the mouth of the Harrison river. The cost of this plant, which has been designed so that its capacity may be increased later, will be in the neighborhood of $3,000,000. The company's plans include the erection of a pulp and paper mill at Kitimat, B.C. This plant will be erected at a later date.

Air Service to New Oil Fields.

A site for a landing-place and aerodrome has been secured at Peace River, Alta., and operations are under way for the construction of buildings that will form the southern terminal of an airplane link in a chain of transportation service between Edmonton and the new oil fields, near Fort Norman, on the Mackenzie River.

OVERSEAS AND FOREIGN INDUSTRIAL NEWS.

The British Glass Industries.

As is well known in Canada, as well as in the United Kingdom, the world was prior to the outbreak of the war largely dependent upon Austria, Belgium and Germany for supplies of the cheaper descriptions of glass bottles, jars, window glass, etc., and to an even greater extent for scientific laboratory ware. Considerable progress has, however, been made during and since the war in Great Britain in the development of glass manufacture, largely by reason of the adoption of the Owens method of production, and some powerful industrial combinations have taken the place of the small concerns which formerly put up an unequal fight against the competition of highly-organized and efficient producers abroad. A good deal of information respecting the recent developments in the industry is contained in a Report just issued in London by the Sub-Committee appointed (under

the Profiteering Acts, 1919 and 1920) by the Standing Committee of the Board of Trade on Trusts, Cmd.1066, twopence, from which it appears that, as the result of successive combinations of manufacturers and associations of manufacturers, practically the entire industry is centred in an institution known as British Glass Industries, Limited, formed early in 1919 by a syndicate of financiers in order to combine the activities of a number of glass manufacturing firms not already included in another concern known as the United Glass Bottle Manufacturers, Limited. The various interlocking arrangements preceding the establishment of British Glass Industries, Limited, may be summarized as under:—

(1) In 1907, 97 per cent. of the British glass bottle manufacturers joined the Association of Glass Bottle Manufacturers of Great Britain and Ireland, the original (price-fixing) association;

(2) In 1908, 90 per cent. of the members of this Association joined the British Association of Glass Bottle Manufacturers, Limited, the English subsidiary of an international company under German auspices known as the Europafscher Verband der Flaschenfabriken formed to acquire (for $3,000,000) the rights for the Eastern Hemisphere. in the Owens automatic machine;

(3) In 1912, 60 per cent. of the (price-fixing) Association of Glass Bottle Manufacturers of Great Britain and Ireland, entered into an amalgamation known as the United Glass Bottle Manufacturers, Limited, who owned fifty per cent. of the capital of the British Association of Glass Bottle Manufacturers, Limited.

In the autumn of 1919, British Glass Industries, Limited, found that they had under-estimated the strength of this concern, the United Glass Bottle Manufacturers, Limited, and all the ordinary shares of the latter concern were acquired as the result of which a watertight combination of the British glass bottle manufacturers has been brought into existence. The "Owens" machine is said to be the only completely automatic bottle making machine successfully operating in the United Kingdom, but several British machines are being experimented with.

With regard to scientific glassware, certain manufacturers were soon after the outbreak of war induced by the Government to embark upon this branch of the glass industry, and they did so in face of many difficulties due to lack of practical knowledge, machinery, formulae and trained labor. Manufacturers received financial assistance from the Government, and the output wa sdeveloped sufficiently to meet the needs of the country for the prosecution of the war, though heavy losses are claimed to have been made in the process of development. In 1916 the scientific glassware manufacturers formed a new association known as the British Chemical Ware Manufacturers' Association which is now stated to be suffering from the effects of importations from Germany at low prices due to the prevailing exchange situation, and has appealed to the Government for special treatment in order to save them from closing down their works.

British Photographic Chemicals.

It is announced by the Board of Trade (Licensing Section) in London (England) that, from December 2nd, 1920, an open general license has been issued for the export of photographic chemicals containing not more than twenty per cent. of coal tar derivatives.

Sale of Poisons in England.

By a notice published in the "London Gazette" of December 3rd, the Privy Council in London has made certain additions to the list of poisons which may not be purchased except by persons known to, or introduced by persons known to, chemists. The additions are coca and any preparation or admixtures containing 0.1 or more per cent. of coca alkaloids; ecgonine and all preparations or admixtures containing 0.1 per cent. of ecgonine; opium and all preparations or admixtures containing 0.2 per cent. or more of morphine; diamorphine (heroin) and all preparations or admixtures containing 0.1 per cent. of diamorphine; and zinc chloride and liquid preparations of zinc chloride, except preparations for soldering or other purely industrial purposes.

Eugenol from Pimento Leaves.

As the result of experiments which have been conducted at the Government Laboratory at Kingston, Jamaica, it has been ascertained that pimento leaves yield about 1.8 per cent. of eugenol, from which iso-eugenol and vanillin can be successfully obtained. It has also been found that iso-eugenol can be produced by the appropriate fermentation of pimento leaves. As eugenol is of high antispetic powers, it is thought that this pimento-leaf oil would find use as an antiseptic constituent of tooth pastes and toilet preparations besides serving for the manufacture of vanillin. From materials at present wasted, it is believed that, if a market can be found, Jamaica can produce 100,000 lbs. of pimento-leaf oil per annum.

Waterpowers of Scotland.

According to the First Interim Report of the Water Power Resources Committee of the Board of Trade in London (England) in the year 1917-18, the whole of the steam-power stations in Great Britain for electricity supply and for electric railways and tramways (but not private power plants) generated 4,628,000,000 Board of Trade units and consumed 7,160,000 tons of coal, whereas reports in the possession of the Committee referred to, and dealing with a portion of Scotland alone, show that nine water power schemes dealt with are capable of generating a continuous supply of 183,500 electrical H.P., corresponding to an output at the hydro-electric stations of 1,200,000,000 Board of Trade units per annum, representing the equivalent of 1,850,000 tons of coal.

Price Lists Wanted.

In the 'Board of Trade Journal" of December 23rd, 1920, His Majesty's Vice-Consul at Guadalajara, Mexico, states that he would be glad to receive catalogues, price lists and discount sheets of manufacturers of drugs, perfumes and articles of toilet. They should be addressed as under:—The British Vice-Consul, British Vice-Consulate, Guadalajara, Jalisco, Mexico.

Claude's Ammonia Process.

On November 11th, 1919, a contract concerning the cession of the Haber Patents (manufacture of synthetic ammonia) was concluded between the Badische Anilin und Sodafabrik and the French Ministry of Reconstruction. The French engineer, Georges Claude, had worked out a process on a similar basis for which an experimental plant had been set up at Grande Paroisse, in France, states the "Frankfurter Zeitung," The advantage of this process is considered to be the fact that it allows without difficulty the manufacture in small quantities in any place where hydrogen is to be won as a by-product. The experimental factory mentioned above has made so much progress in the course of this year that at present 1½ tons of fluid ammonia are delivered every day as against 150 litres per day in January, 1920. For the sake of comparison it may be noted that the production at Oppau by the Haber process was, in 1913 20,000 tons; in 1914, 50,000 tons; in 1916, 300,000 tons; and in 1917, more than 500,000 tons, while at the present time 200 tons are stated to be delivered in the space of 24 hours.

Tidal Power.

In its Third Interim Report to the Board of Trade the Water Power Resources Committee deal with the question of utilizing the tides for power purposes in England and Wales. The Committee had under consideration two tidal power schemes for the Severn Estuary, which, although preliminary, were based on investigation of the actual conditions of the site, and were accompanied by estimates of cost.

Industrial Notes.

The first indigo forecast issued by the Department of Statistics, India, shows that the total area sown is estimated at 181,400 acres, or 13 per cent. lower than that for 1919. The yield of

dye (excluding Bombay and Sind) is estimated at 24,600 cwts, as compared with 25,700 cwts in 1919.

The increasing demand for mineral oil has led to important developments in South Africa, and the South African Oil Corporation believes that tests made of shales from Kromhoek and elsewhere in the Union promise an output of oil of the utmost value to South African transport and industries.

According to the Journal of the Yokohama Chamber of Commerce, the total number of oilfields throughout Japan is 2,919, comprising an area of over 1,160,000,000 tsubo. Only 225 fields are at present active, the combined annual production being about 1,971,800 koku.

Soldering aluminium has so far been found rather difficult, mainly due to the lack of a suitable flux and the great tendency to oxidation on the application of heat. It has now been found satisfactory to use a mixture of from 1 to 10 parts of phosphor-tin to 100 parts of zinc. A 1-100 mixture is specially recommended because the lower the phosphor-tin the higher will be the melting point and the harder will be the solder. It is, however, doubtful whether this suggestion will prove superior to the generally accepted practice of welding with an oxygen flame.

The scheme for a combine of all the sulphur-black dyestuff manufacturers in Japan is making steady headway. The factories concerned number eighteen, with paid-up capital amounting to four million yen, and business and other rights of 2,000,000, yen making a total capitalization of 6,000,000 yen for the proposed merger.

A company of English and Australian investors has purchased the Latrobe shale oil deposits in Tasmania, and has acquired patent rights for producing motor spirit therefrom. The company will instal plant capable of a yearly output of 100,000 tons.

A new alloy of copper and aluminium has been invented and tested by the Aktiebolaget Skandinaviska Armaturfabriken at Stockholm, Sweden. The name given to the new combination is "alcobronze". It has the color and lustre of gold, and it is said to be stronger, tougher and harder than any other bronze. It can be wrought, forged or rolled in any way without suffering deterioration, and it resists the influence of the air, acids, and salt water, being therefore particularly suitable for ships' forgings, propellers, condensers, machine parts, bearings, surgical instruments, skates, ornaments, seaplanes mechanism, etc.

LATEST CANADIAN CHEMICAL AND METALLURGICAL PATENTS

Reported to Canadian Chemistry and Metallurgy by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Treating Zinc Oxide.
Frank G. Breyer, Earl H. Bunce, 207542, Jan. 11, 1921. ZnO is passed by the action of gravity in the form of a relatively thin stream or sheet through a highly heated atmosphere and is maintained at the elevated temperature for an extended period. This improves the color of the oxide. A vertical tubular retort or furnace is used.

Method for the Removal of Solid Nitrogen Oxides from Refrigeration Devices.
Einar Bergve, 208007, Jan. 25, 1921. Solid oxides of N are removed from refrigeration devices in a liquid condition by introducing an oxide of N in a gaseous condition into the space containing the solid oxides to be removed.

Extracting Molybdenum and Other Metal Oxides from Ores.
F. D. S. Robertson, 207908, Jan. 25, 1921. Molybdenite is heated in an oxidizing gas current to a temperature high enough to oxidize the MoS_2 and volatilize the oxide, the fume is passed through a collector to deposit the MoO, at least part of the gases from the collector are returned into contact with more heated MoS_2 to pick up more oxide and sufficient O is introduced into the gas current to maintain its oxidizing character.

Utilization of Peat.
N. Testrup, 207257, Jan. 4, 1921. Peat is subjected to heat under pressure sufficient to prevent evaporation to destroy its water binding and develop its acid properties. Part of the peat may then be used for the production of NH_3 and the rest for the absorption of the NH_3 thus formed and used as a fertilizer.

Metallurgical Processes.
Jno. T. Jones, 207228, Jan. 4, 1921. Finely divided ore containing Fe and Mn is mixed with finely divided carbonaceous material and heated to about 2000° F in the absence of air to coke the carbonaceous materia and reduce the Fe to the metallic state. The Fe is separated out and the Mn reduced to the metallic state.

Reduction of Metallic Oxide Ores.
Jas. W. Moffat, 207431, Jan. 11, 1921. Finely divided oxide ores are fed into the upper part of an air tight furnace and heated in the presence of a reducing gas, the ore being constantly lifted and dropped through the gas in such a manner that the ore particles are individually and repeatedly presented to the action of the gas without movement longitudinally in the furnace and until the O is practically all removed, and then withdrawing the reduced ore at the bottom of the chamber. The product is ready for smelting in an electric furnace. Apparatus for so treating the ore is also specified.

Process for Making White Lead.
Wm. P. Thompson, 207999, Jan. 25 1921. Unmolten, anhydrous litharge is treated under constant stirring and preferably under pressure, with a mixture made at a temperature not exceeding 60° of air, carbonic acid fumes of dilute acetic acid.

Nitric Acid.
P. A. Guye, 207226, Jan. 4, 1921. An aqueous solution of HNO_3 is caused to react with N_2O_5 in the nascent state formed in immediate proximity to the solution by the reaction between N_2O_4 and ozone.

Production of Alkali Sulphides from Silicates.
Einar Bergve, 208006, Jan. 25, 1921. Sulphides are produced from alkali metal silicates by smelting the latter with ferrosilicon and pyrite.

Sulphatising Metal Sulphides.
J. G. Aarts, and C. J. G. Aarts, 207771, Jan. 25, 1921. Sulphide ores are sulphated by roasting the material at 900° C and then subjecting the material to the action of O containing roast gases at a gradually decreasing temperature, the gases moving in parallel with the material. Oxide ores may be similarly treated with the addition of S or pyrites.

Separating Iron and Nickel from Copper Mattes.
W. Borchers, 207476, Jan. 11, 1921. Matte is smelted with lime in a furnace lined with carbonaceous reducing material, the Fe and Ni sulfides are first reduced to a considerable extent, then ferro Ni is formed with the addition of more C.

Production of Radioactive Substances by Adsorption.
E. Ebler, 207478, Jan. 11, 1921. A solution containing Ba and Ra chlorides is treated with precipitated hydrated MnO_2 and the solid products after separation of the solution are treated with hot HCl to dissolve the radioactive substances.

Process of Producing Alloys Stable Against Strong Acids.
W. and R. Borchers, 207477, Jan. 11, 1921. The acid resisting power of metals of the Fe group is improved by alloying therewith 30-40% of Cr and about 5% of another metal of the Cr group.

Metal Oxides and Other Compounds By the Wetherill Process.
Jas. A. Singmaster and Frank G. Breyer and Albert E. Half, 207541, Jan. 11, 1921. In the production of "sublimed lead" or other metal oxides or compounds of volatizable metals by the Wetherill process, the fuel bed on the furnace hearth is formed of briquets. Sublimed basic Pb sulfate is produced from PbS and C with oxidation of the fume.

Zinc Oxide.
Jas. A. Singmaster, 207543, Jan. 11, 1921. In the production of sublimed ZnO a bed of a reducible compound of the Zn and a combustible material is formed, ignited and advanced during its combustion through a suitable chamber while a combustion supporting draft current is forced through the bed and the effluent is collected at successive points along the path of movement.

Zinc Oxide.
Jas. A. Singmaster, 207544, Jan. 25, 1921. Apparatus for operating the process of Can. Patent 207543, comprises a refractory tunnel structure, a travelling grate surface adapted to move therein, means for transmitting combustion supporting gas through the grate surface and a plurality of fume off-takes.

Zinc Oxide.
Jas. Singmaster and Frank G. Breyer, 207545, Jan. 11, 1921. In the production of ZnO or leaded ZnO by the Wetherill process the fuel bed is supplied to the furnace hearth in the form of briquets which may also contain the Zn-bearing material.

Vinegar Making.
E. Klein, 207559, Jan. 11, 1921. This patent relates to the Schutzenbach process of making vinegar and aims to standardize the process, avoid losses by evaporation and render the process independent of the external atmospheric conditions. The fresh air is precooled and the internal temperature of the generator is controled by passing the precooled air therethrough in an ascending current. The fluid mixture, capable of undergoing acetic fermentation, is precooled and the vapors carried by the spent air are condensed by introducing the precooled mixture near the top of the generator.

Chemical, Oil and Metal Markets

The quotations below represent manufacturers' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

MARKETS.

The outlook on the chemical market is considerably brighter at the beginning of February than it was one month ago, and, it will be remembered, January was a better month than December, so the period of depression that obtained throughout October, November and December, is gradually, day by day, disappearing. Conditions on the market at Montreal and Toronto are more active than at the opening of the new year, and doubly so to what they were in December. Dealers are practically unanimous

in reporting more enquiries from regular customers, more actual orders, and a better disposition on the part of buyers to take contracts. This latter factor is the result of many buyers realizing that the trend of prices downwards has just about stopped in most lines, and in certain lines, such as soda ash, caustic soda, sulphuric acid, has reached the bottom. A feature of the Canadian market during the past week or ten days has been the large amount of English made products offered. These are noticable in glues and sodium benzoate, and the influx of the latter from English sources has cut the price from $1.15 to 90 to 95 cents.

Conditions are somewhat improved on the United States market, though the large amount of second hand material in many lines is still proving a factor and causing prices to be unstable. Latest reports from New York, however, show that stability is gradually returning in some lines, and that greater confidence is apparent on the part of buyers.

Sulphuric Acid.

Single carboys of sulphuric acid could not be obtained today at either Montreal or Toronto at a price below $3.00 per 100 lbs. There is of course a sliding scale down to $2.50 per 100 lbs., the price decreasing as the amounts increase. The average buyer of sulphuric, however, unless he can order in tank car lots, will find $2.75 a very fair price.

Bleaching Powder.

Bleach has eased off a little and is quoted at .05 to .05½ c., a decline of a cent per lb. since January 1st. The producing plants are in much better shape as regards coal supply, but a further decline is not very likely. Demand for bleach is brisk as several of the paper mills are behind in their orders and require a steady supply.

Caustic Soda.

Caustic soda has declined a half cent per lb. during the past ten days and the ground is quoted at from 6 to 6½c. per lb. The solid is selling at about ¾ of a cent cheaper. Producers claim that the bottom has been reached in the price on caustic. There is a good demand and several good-sized contracts have been recently made.

Fine Chemicals and Pharmaceuticals.

Pharmaceuticals are much steadier. Declines are noticeable, however, in citric acid, aspirin, salicylic acid, tartaric acid, calomel, and formaldehyde. Glycerine (c.p.) has advanced to 35 cents per lb. with the pale straw or dynamite grade quoted one cent lower. The scarcity of crudes is responsible for the advance in the c.p. grade.

RUBBER.

The rubber market is still dull and the renewal in the industry expected for January has not yet occurred. Those in closest contact with the market and the industry look for business to pick up during the next six weeks. Future quotations at New York certainly verify this prediction of a revival, for ribbed-smoked sheet is quoted at 18½c. per lb. for February, 19c. for March, 21¾ for April to June, and 25c. for July to September. When compared with the present quotations as given in our price list, it will be seen that the industry is very confident that better times are ahead and that the present period of depression probably disappear within the next two months.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals.

Inorganic.

Alum, Ammonia, lump and ground	100 Lbs	5.50— 6.00
Ammonium Bromide	Lb.	.. — .65
Aluminium Sulphate, high grade, bags	100 Lbs.	. — 4.75
Ammonia, Aqua 26	Lb.	.11— .12
Ammonium Carbonate	Lb.	.20— .22
Ammonium Chloride	Lb.	.15— .20
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .14
Barium Sulphate (Barytes)	Per Ton	40.00—45.00
Barium Chloride	Lb.	.05—.07½
Barium Nitrate	Lb.	.. — .20
Barium Sulphate, B.P.	Per Ton	.. —120.00
Battery Acid, up to and including 1.400 sp. gr.	Cwt.	3.00— 3.50
Battery Acid, over 1.400, up to and including 1.835 sp. gr.	Cwt.	3.50— 4.00
Bleaching Powder, 35% drums	100 Lbs.	.05—.05½
Borax, crystals	Lb.	.09¾— .10
Boric Acid, powdered	Lb.	.17—.17½
Calcium Carbide, car lots, f.o.b. works	Ton	.. —100.00
Calcium Carbide, ton lots, f.o.b. works	Ton	.. —105.00
Calcium Carbide, less than ton lots, f.o.b. works	Ton	.. —110.00
Caustic Soda, ground, drum	Lb.	.06—.06½
Caustic Soda, solid, drum	Lb.	.05¼—.05¾
Calcium Chloride, fused	Per Ton	58.00—60.00
Camphor Monobromate	Lb.	.. — 3.00
Carbon Bisulphide, in drums	100 Lb.	.. — .12
Carbon tetrachloride, drums	Lb.	.18— .20
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	35.00—45.00
Cobalt Oxide, black	Lb.	.. — 3.70
Copperas (Iron Sulphate) crystals	Lb.	.. —.02¼
Copperas (Iron Sulphate) sugar	Lb.	.. —.02¼
Copper Sulphate (Blue Vitriol)	Lb.	.09—.09¼
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 1.45
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fuller's Earth, car lots, f.o.b. Toronto	Ton	35.00—40.00
Ferric Chloride, crystals	Lb.	.15— .16
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid, 60%	Lb.	.. — .32
Hydrofluoric Acid, 30%	Lb.	.. — .14
Hydrochloric Acid, carboys, 18	100 Lbs.	2.75— 3.00
Hydrogen Peroxide	Gal.	.. — 1.05
Iodine, crude	Lb.	.. — 4.75
Iodine, resublimed	Lb.	.. — 5.50
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lithopone	Lb.	.09½—.10½
Magnesite, calcined	Per Ton	.. —25.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.18— .20
Magnesium Sulphate	Lb.	.04— .05
Mag. Sulphate, B.P., Medicinal	Single Ton	90.00—95.00
Mag. Sulphate, B.P., Technical, car lots	Ton	70.00—75.00
Muriatic Acid, 18	100 Lb.	2.75— 3.00
Nitric Acid, 36 carboys	100 Lb.	.09—.09¼
Phosphoric Acid, 85%	Lb.	.43— .50
Phosphoric Acid, 50%	Lb.	.29— .31
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. — .65
Potassium, Bromide, granular	Lb.	.57— .60
Potassium Bichromate	Lb.	.. — .40
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — ..
Potassium Chlorate	Lb.	.. — .18
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots		.20— .25
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots		.80— .35
Potassium Hydroxide (Caustic Potash)	Sticks	.. — 1.00
Potassium Iodide	Lb.	4.00— 4.25
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.. — .75
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Silver Nitrate	Lb.	12.00—14.00
Soda Ash, bags	Lb.	.03—.03¼
Sodium Acetate, ton lots or over	Lb.	.. —.12¼
Sodium Acetate, lesser amounts	Lb.	.. — .15
Sodium Benzoate	Lb.	.90— .95
Sodium Bicarbonate, 100% pure	100 Lb.	3.85— 4.00
Sodium, Bichromate, bbls.	Lb.	.16— .20
Sodium Bisulphite, powder	Lb.	.. —.09½
Sodium Bisulphite, 35	Lb.	.05½— .06
Sodium Cyanide, bulk, 93-99%, in cases	Lb.	.30— .32
Sodium Hyposulphite, kegs	100 Lb.	5.00— 5.75
Sodium Nitrate, refined	100 Lbs.	7.50— 8.50
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	.. — 2.25
	Per Cwt. in Car Lots	.. — 2.00
Sodium Sulphite	Lb.	.. — .07
Sodium Prussiate, Yellow	Lb.	.27— .35
Sulphur, ground	100 Lb.	2.75— 3.00
Sulphur, roll	100 Lb.	4.50— 4.75
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.50— 3.00

Talc, No. 1 grade	Ton	.. —35.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	..—18.00
Tin Chloride, crystals	Lb.	.40— .45
Tri-sodium Phosphate	Lb.	.08¼—.08½
Ultramarine, Blue	Lb.	.20— .50
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting (English)	Ton	.. —40.00
Whiting (American)	Ton	.. —35.00
Whiting	Per Ton	35.00—40.00
Zinc Sulphate, com.	Lb.	.05¾—.06½
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.12— .15
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.. — .55
Acetic Acid, 28%, carload lots	Lb.	.. —.04½
Acetic Acid, 28%, 25 bbl. lots	Lb.	.. —.05¼
Acetic Acid, 28%, 15 bbl. lots	Lb.	.. —.05½
Acetic Acid, 28%, 10 bbl. lots	Lb.	.. —.05¾
Acetic Acid, 28%, 5 bbl. lots	Cwt.	.. — 5.85
Acetic Acid, 28%, 3 or 4 bbl. lots	Cwt.	.. — 5.90
Acetic Acid 28%, 1 or 2 bbl. lots	Lb.	.. — .06
Acetic Acid, 80%, carload lots	Lb.	.. — .12
Acetic Acid, 80%, 25 bbl. lots	Lb.	.. — .14
Acetic Acid, 80%, 15 bbl. lots	Lb.	.. — .15
Acetic Acid, 80%, 10 bbl. lots	Lb.	.. —.15½
Acetic Acid, 80%, 5 bbl. lots	Lb.	.. — .16
Acetic Acid, 80%, 3 or 4 bbl. lots	Lb.	.. — .17
Acetic Acid, 80%, 1 or 2 bbl. lots	Lb.	.. —.17½
Acetone, pure, drums or over	Lb.	.. — .20
Acetone, pure, lesser amounts	Lb.	.. — .25
Aspirin, in 100-lb. lots	Lb.	.90— 1.05
Alcohol, acetone, bbls. or over	Gal.	.. — 2.00
Alcohol, acetone, lesser amounts	Gal.	.. — 2.25
Alcohol, pure, bbl., 65% O.P.	Gal.	.. —10.50
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 1.75
Alcohol, wood, 95%, half bbl. lots	Gal.	.. — 1.85
Alcohol, wood, 95%, lesser amounts	Gal.	.. — 2.00
Alcohol, wood, 97%, bbls.	Gal.	.. — 1.78
Alcohol, wood, 97%, half bbl. lots	Gal.	.. — 1.90
Alcohol, wood, 97%, lesser amounts	Gal.	.. — 2.05
Amyl acetate, technical	Gal.	4.75— 5.25
Amyl acetate, pure	Gal.	5.75— 6.25
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — 1.25
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 1.60
Carbolic Acid, white crystals	Lb.	.. — .30
Chloroform	Lb.	.55— .75
Citric Acid, domestic, crystals	Lb.	.. — .85
Coumarin	Lb.	.. — 6.00
Cream Tartar, 98%	Lb.	.55— .60
Dextrine	Lb.	.. — .09
Ether, Sulphuric	Lb.	.35— .80
Formaldehyde, bbls. or over	Lb.	.. — .25
Formaldehyde, 200-lb. kegs	Lb.	.. — .28
Formaldehyde, 100-lb. kegs	Lb.	.. — .29
Formaldehyde, 50-lb. kegs	Lb.	.. — .30
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Gallic Acid	Lb.	1.25— 1.75
Glycerine, C.P., single tin of 56 lbs.	Lb.	.. — .35
Glycerine, C.P., two or more tins	Lb.	.. — .33
Glycerine (pale straw) single tin 56 lbs.	Lb.	.. — .34
Glycerine (pale straw) two or more tins	Lb.	.. — .32
Hexamethylenetetramine		.. — 2.00
Oxalic Acid	Lb.	.30— .35
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.50
Phenolphthalein	Lb.	.. — 2.10
Pyrogallic Acid	Lb.	3.00— 3.50
Quinine	Oz.	1.00— 1.10
Saccharin	Lb.	4.50— 5.00
Salicylic Acid	Lb.	.55— .60
Stearic Acid, Double Pressed	Lb.	.23— .27
Stearic Acid Triple Pressed	Lb.	.26— .30
Tartaric Acid, crystals or powdered	Lb.	.75— .80

Rubber.

The following quotations on rubber are in American funds, New York delivery:

Crude.

Para, upriver	Lb.	.. — .18
Caucho Ball, upriver	Lb.	.. — .15

Plantation Rubber.

1st Latex Crepe	Lb.	.. — .19
Smoked Sheet	Lb.	.. —.18½

Scrap Rubber.

Boots and shoes	Lb.	.04— .05
Automobile tires	Lb.	.. — .01
Steam and fire hose	Lb.	.. —.01¼
Inner tubes, No. 1	Lb.	.. — .08
Inner tubes, No. 2	Lb.	.. —.05¾

Tanning Materials.

Archil, extract	Lb.	.. — .35
Fustic Crystals, extract	Lb.	.17½—.22½
Hematine Crystals, extract	Lb.	.39— .42
Logwood Crystals, extract	Lb.	.39— .42
Quercitron, extract	Lb.	.. — .12
Sumac, extract	Lb.	.. — .10
Sumac extract liquid, dark	Lb.	.. — .08
Sumac, extract liquid, colorless	Lb.	.. —.17½
Sumac, powdered	Lb.	.31— .35
Tannic Acid, commercial	Lb.	.75— .80

Metals.

Aluminium, No. 1, 98-99%	Lb.	.. — .33
Antimony	Lb.	.. —.08½
Brass, yellow ingots	Lb.	.. — .16
Brass, red	Lb.	.. — .18
Cobalt, metal	Lb.	.. — 5.00
Cobalt Oxide, grey	Lb.	.. — 3.95
Copper, electrolytic, small lots	Cwt.	.. —16.75
Copper, electrolytic, car lots	Cwt	.. —16.25
Copper, casting, small lots	Cwt.	.. —15.75
Copper, casting, car lots	Cwt.	.. —15.25
Gold, Pure	Oz.	23.00—25.00
Iron, Pig	Ton	.. —43.00
Lead, pig, small lots	Cwt.	.. — 6.40
Lead, pig, car lots	Cwt.	.. — 5.90
Magnesium, ribbon	Lb.	.. —18.00
Magnesium, powder	Lb.	3.00— 3.50
Mercury	Lb.	.. — 2.50
Nickel, shot or ingot	Lb.	.. — .40
Platinum, pure	Oz.	85.00—90.00
Silver, bar	Per Troy Oz.	.. — .99
Steel, mild, ¼ inch, base price	Cwt.	.. — 5.75
Steel, mild, 3/16 inch, base price	Cwt.	.. — 6.25
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	8.15— 8.50
Tin	Lb.	.. — .45
Zinc, sheets	Lb.	.. — .22
Zinc (spelter) small lots	Cwt.	.. — 7.00
Zinc (spelter) car lots	Cwt.	.. — 6.50

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .42
Motor Gasoline (service stations)	Gal.	.. — .45
Lighting Gasoline	Gal.	.. — .47
Naphtha	Gal.	.. — .41
Coal Oil	Gal.	.. —.29½
Fuel Oil	Gal.	.. — .17
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 3.50
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 6.10
Crude Creosote Oil	Bbl.	16.00—18.00
Refined Creosote Oil	Bbl.	20.00—22.00
Crude Coal Tar	Bbl.	.. — 7.25
Refined Coal Tar	Bbl.	.. — 8.50
Coal Tar Pitch, in Bbls.	Ton	.. —24.00
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52—. 57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .12
Naphthalin Balls	Lb.	.. — .13
Alpha-Naphthylamin	Lb.	.45— .50

Flotation Oils and Naval Stores.

Spirits of Turpentine, in bbl. lots..(Imp.)	Gal.	.. — 1.18
Rosin, Grade G, in 280 bbl. lots		.. —11.00
Rosin, Grade W.W., in 280 bbl. lots		.. —11.15

Gums and Vegetable Oils.

Vegetable Oils—

Anise Oil	Lb.	2.10— 2.25
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .28
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .30
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.30— .32
Linseed Oil, raw, in bbl. lots ....(Imp.)	Gal.	.. — 1.00
Linseed Oil, boiled, in bbl. lots ...(Imp.)	Gal.	.. — 1.03
Monopole Oil	Lb.	.. — .30

Gums—

Indian, No. 1A	Lb.	.. — .40
Indian, No. 1	Lb.	.. — .38
Tragacanth, No. 1, Ribbon	Lb.	.. — 4.50
Tragacanth, No. 1, Flake	Lb.	.. — 3.50
Tragacanth, Turkey	Lb.	.. — 3.75
Arabic, clear amber sorts	Lb.	.. — .18
Arabic, regular grain No. 4 and No. 6	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22½
Arabic, white sorts	Lb.	.. — .40
Arabic, powdered, No. 1	Lb.	.. — .25
Arabic, powdered, No. 2	Lb.	.. — .24

Fertilizer Materials.

Animal Tankage, per unit of Ammonia		7.00— 7.50
Animal Tankage, per unit of Bone Phosphate of lime		.. — .10
Nitrate of Soda	Ton	100.00—105.00
Muriate of Potash	Cwt.	7.00— 7.50
Pure Ground Blood, per unit of Ammonia		6.50— 7.00
Steamed Bone Meal	Per Ton	65.00—70.00

C. P. Chemicals.

Ammonia, C.P.	Lb.	.. — .26
Hydrochloric Acid, C.P.	Lb.	.. — .15
Nitric Acid, C.P.	Lb.	.. — .23
Sulphuric Acid, C.P.	Lb.	.. — .14

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EDITORIALS

WHO IS AN ENGINEER?

ANYONE who attended the meetings and, especially the banquet of the E.I.C., at Toronto, had two things impressed upon him; first, that Canadian Engineers are a particularly cheerful lot of scientists, and second that they are not quite sure whereat they have arrived, or whether they have arrived.

The valedictory of the retiring president, Mr. R. A. Ross, was a thoughtful consideration of changing conditions, expressing in a general way the view that the E.I.C. was entering a broader phase of activities, wherein the old clean cut definitions were ambling their "bridge of sighs" into oblivion.

A subsequent discussion of the grades of membership, again brought the matter to the fore. At the banquet there was a noticeable drift in several addresses to a redefinition of the word "engineer". Notably when Mr. Munro Grier introduced in a brilliant address the Chaucerian definition of "engine" as mental energy. Finally Dr. Kimball of Cornell University, defined an engineer as one who uses scientific methods in his work.

It is a question whether we have quite reached the stage where all the strategists of industry are to be regarded as engineers. The difference, however, in the activities of the civil and military engineers of the "70's" and "80's" and the hydro-electric engineer of to-day, is not less marked than that between the electrical engineer and the director of personnel, or the production engineer of a great industry to-day. Then there is the Chemical Engineer, though a prominent chemist, considered to be one, says there is no such animal.

The proposed legislation in Ontario, if it goes through, would allow chemists the legal title of "Registered Professional Engineer," so there we are. Have we broadened out, or is it a case of smiling tiger?

CHEMICAL ENGINEERING IN THE PAPER INDUSTRIES.

WITH this issue we commence a series of articles dealing with the function of the Chemical Engineer in the pulp and paper mills of Canada. There are mills where the hose has been turned on the Chemist, and not by accident; there are mills where very nearly everything that possibly could be done has been tried to keep the "university" trained technical man on the outside. The tenacity with which a certain type of superintendent and foreman has fought against the introduction of real control is amazing. Happily, the pulp and paper industry has for the most part, been won over to the new point of view. Pioneering chemical engineers have made good. They have actually saved money for their employers and increased production. Some of those who "have grown up" with the industry, have received severe punctures, but on the whole, everyone still has his job and more pay, and the industry is growing bigger and stronger than ever. The engineer in general, and the chemical engineer in particular, has had much to do with it. The articles by Mr. R. W. McKenzie deal with conditions as they are found, and his experience has been sufficient.

PROFESSIONAL ENGINEERING LEGISLATION.

THE chemists of Ontario are much interested in the Bill before the Ontario Legislature at the present time relating to the registering of Professional Engineers. Already similar legislation has been passed in British Columbia and Manitoba.

No attempt has been made to define an Engineer, but the Bill does state what is meant by Professional Engineering, and includes the functions of chemists. Legally then, provided the Bill is carried, a man to direct chemical operations generally, must become a registered Professional Engineer. It will be noticed that he need not cease to be a chemist and it is not probable that the passing of such a bill will be reflected in any way by alterations in present chemical societies.

The Canadian Institute of Chemistry is a Dominion organization to which all chemists will look in matters relating to the profession both within or without the Dominion, but it cannot function directly in a provincial matter where the chemists of a province are alone considered. Unfortunately, chemists were not well prepared for the reception of such legislation as they had no provincial organization in Ontario.

There are a number of features about the final draft of the bill which should appeal to all chemists. Both the definition of Engineering is broad, and the qualifications relating to entrance are made wide enough to admit specialists in all the fields affected.

At first sight it did appear that the definition of what constituted Professional Engineering had

been made broader than the qualifications for membership. Geologists, chemists, and graduates of other courses whose work is as specialized, might not receive fair treatment under the clause which made it necessary to be a graduate of a course in Engineering in order to obtain admission upon graduation. In short, some distinction was made among graduates depending upon the course they had taken. While of no interest to a large number of engineers, this is a most important matter to those concerned. It is not possible to broadly define "Professional Engineering" and then say that courses in physics, chemistry, or geology are not equivalent to courses in engineering as far as admission to practice is concerned.

It is not to be considered that any number of engineers would desire to do any injury to individuals as well qualified as they themselves, although the path which leads to the work is one not followed by the majority of engineers as the word is commonly understood. It is believed that the Draft Bill will be finally passed after due amendment in a shape quite satisfactory to all concerned.

Any legislation which tends to a further recognition of the work of scientific men and their relation to economic progress, is most important, and as we are in an era of "broadening out" as far as Ontario is concerned, it will not be ruinous if the name "Chemist" is submerged for legal purposes. Beyond being a distinguishing mark among chemists themselves, it has never helped the profession very far.

Let us hope that there will be a great ordering of seals upon which it will be not only possible to put the words "Registered Professional Engineer," but also as we understand it, the word "Chemist" may be placed in the middle if anyone so desires. It is not exactly a change of name, but a new one that the chemists of Ontario are about to receive, provided the bill goes through.

KE UP THE SLACK.

THIS is the history of two men who thought they knew a labor-saving short cut. They had to hoist a stick of timber to the second floor, and were ordered to do so with a block and tackle, but they saw a running shaft, and decided to make it do the work for them. So they hitched a rope to their timber, and giving the other end a turn round the shaft, pulled the rope tight. They had not figured that a four inch shaft at two hundred revolutions per minute would run the timber up pretty fast. This surprised them so much that they lost control of the slack, which tangled round their feet and pulled them round the shaft with fatal results.

The large profits made by certain industries, the high wages paid to certain artisans, the emergencies, the subservience of economy to the paramount calls for munitions all coming to a halt in a short period, produced a large amount of slack, and this has become somewhat tangled round our feet. To make progress this must be untangled. Its no use getting impatient and just yanking at a loop here, or an end there. The threads must be followed out, and this will require time, patience and forebearance. The mutual sacrifices made to carry on in war must be made to carry on in Peace.

"Peace is not a product of documents; it is the product of good will among men." This aphorism of Mr. Hoover's is well worth repeating. If two men set out to unravel a tangle, they must not try competitive methods, they must co-operate.

FACT vs. FICTION, THE NEW LITERATURE.

ROBERT KENNEDY DUNCAN, a Brantford, Ontario boy, by the way; Ellwood Hendrick, and now Edwin Slosson, are creditors to the reading public in that they pioneered into a new sea of literature, the readable scientific text book.

We have just read Slosson's "Creative Chemistry" and can bespeak for it a hearty welcome to that five foot eight bookshelf. When we wish to, while reading it, we can consider Canadians as being American; when we don't wish to, we need not, but we can enjoy its style, assimilate its sugar coated science, endorse its purpose, for it has a mission. That mission is to show the American people how essential it is that the nation appreciate its need for a home made chemical industry. Canada too needs more Canadians who will think "Canada First" in the development of industries.

Both in Great Britain and America, a number of dyestuffs in all colors and of very high permanence have been produced and can be manufactured in much greater quantities, but the style dictators continue to insist on ranges of shades, which at present are made in Germany. That line of action can only result again in flattering the over weaning German mentality, and discouraging the efforts of our own dye makers.

It is not safe that any nation should consider itself in a position to dictate in scientific matters to the world, whether that idea is a fact, or only evolved from its inner consciousness.

It is advisable that chemists generally endeavor to inform the layman that coal tar is not only a source of dyes but of valuable pharmaceuticals, and that the world can ill afford to let the control of these products become one nation's monopoly. Slosson's book is written for the layman, and aims

to show that the chemist not only reproduces in great purity, substances found in nature, but actually prepares dyestuffs, and pharmaceuticals not found in nature, and that his work might properly be regarded as creative.

The German chemist is not the Alpha and Omega of chemistry, and while much credit for painstaking attention to almost infinite detail should be given to many of the German chemists, and admiration to some of their outstanding great thinkers in chemistry; a great proportion of the creative chemical work of the world has been done by English speaking, French, Belgian, Dutch and Japanese chemists.

Germany is well located for the coal tar industry for Europe, as a center of population, and she has organized her industries well, but the United States and Canada have a population of about 115,000,000 people largely engaged in industrial pursuits. There is an enormous potential coal tar industry now going criminally to waste in our burning of steam coals directly under boilers. We shall be very sorry about this waste some day. The spread of such literature as Slosson's would perhaps, hasten the day when this waste will be as much out of the question as that entailed in recovering only burning oil from crude petroleum.

THE AMERICAN DOLLAR.

THE American dollar has expanded beyond the clutch of nearly every one outside of the United States. England can hardly hold it at all, France and Germany gave up long ago, and Canada is having a tremendous time keeping her dollar with skin on its bones.

Supposing a man enters a safe containing all the gold in the world. If he locks the door, he will die eventually. So must the Export Business of the United States unless the rest of the world be given a chance. For example, a Frenchman may have a process for making something that is twice as inefficient as a company in the United States, yet he can easily sell in New York for about half the cost of production in America. If any country in such a position seeing this, adopts a policy designed to protect those who cater to the internal market only, the method used is to adopt protection or build a wall. This helps internal business, continues the unstable equilibrium of trade within the country, but cuts off absolutely the general business of buying or selling in world markets. One of the international questions of the moment is whether or not the United States can profitably continue with such a policy. Can a nation like an individual, live on the interest which the world hands over to it and not enter into world markets? With a very few exceptions, the United States does not need protection for the creation of basic industries, but she does need volume to keep them going. It is sometimes not easy to get a new customer, but with the Government's fleet and a growing European market, Canada may be able to adjust herself. If we sell wheat in England, we will buy back evaporators for example, all of which has some significance for American business.

Our best advice would be to think twice before ever locking up the safe, even though it is big and you have all the gold in the world with you. We all live by breathing out as well as breathing in.

GERMAN BRAINS IN AMERICAN INDUSTRY.

CONSIDERABLE publicity has been given the introduction of two particular German chemists, into the organization of the Du Pont Company. These men are presumed to be experts in the manufacture of certain dyes. Two German chemists, if that be all the story, are not likely to ruin the independence of American Chemical industries. At the same time, there is reason to consider the safety or necessity of the policy. We doubt seriously, if chemists from Germany or people from other countries, come to the United States or immigrate in general with any other object than to make money. If they did, it would not be such a problem to make new citizens out of them, In the Canadian West, there are many American born citizens who are for a generation or so, more likely to feel disposed to celebrate the 4th of July than the 1st. They came to Canada because good land was cheap.

We must reduce all our considerations to an economic basis fundamentally. Then from common interests, a national life is erected. The economic basis that the allies are facing is this, according to latest reports, "Germany is now exceeding her pre-war production of coal tar dyes, according to the dye experts of the Reparations Commission. Dyes produced in January (1921) are estimated at 12,000 tons or 750 tons more than the average monthly output before the war". What is a company in the United States or England to do if they can neither find local specialists, import them, or obtain trade protection?

CONSTRUCTION WORK ON CHIPPEWA POWER CANAL PROGRESSING

Construction work on the great power development project being carried on by the Ontario Hydro-Electric Power Commission is progressing at splendid speed and, according to engineering calculations, will be ready to deliver power by September 1st next. On that date it is expected two units of 55,000 h.p. each will be ready for distribution. Work on the other units will of course be gone on with without any delay in operations.

The Precipitation of Some of the Rare Earths by Creams of Insoluble Oxides and Carbonates, Based on the Principle of Hyrolysis

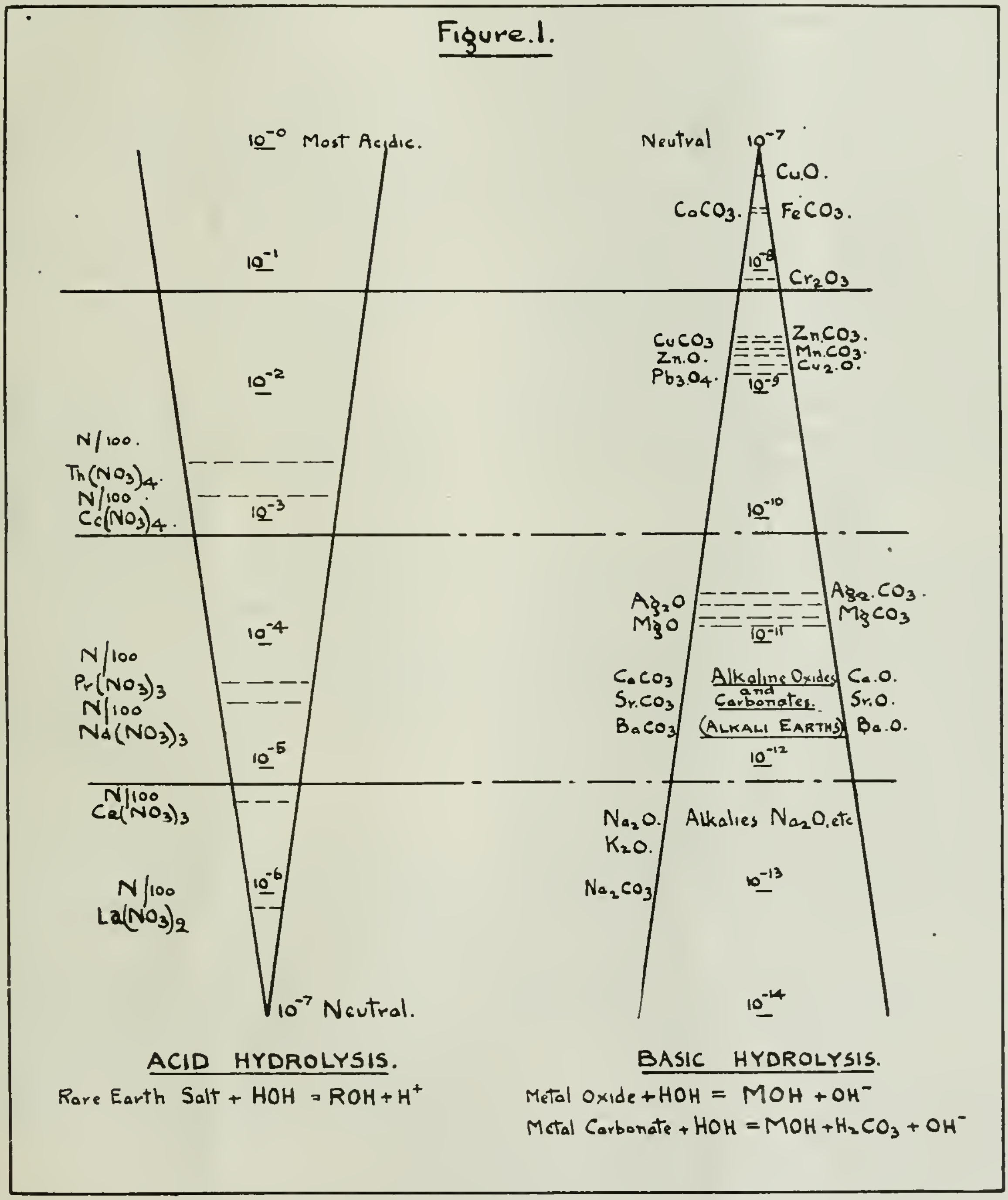
By ARTHUR C. NEISH and J. W. BURNS*

THE fact that the salts of the various rare earths differ in hydrogen ion concentration due to hydrolysis, suggested that by treating a solution of the different rare earths with creams of various oxides and carbonates, insoluble in water, which would give varying degrees of hydroxyl ion concentration, a separation might be made.

The object of the research was to predict the precipitant for each of the rare earths, after measuring the hydrogen ion concentration of some of the rare earths and the hydroxyl ion concentration of the oxides and the carbonates.

The rare earths arrange themselves as follows. Thorium (most acidic) gives greatest hydrogen ion concentration due to hydrolysis, cerium(-ic), neodynium, praesodynium, cerium(-ous) and lanthanum, give lowest hydrogen ion concentration due to hydrolysis.

The oxides and carbonates seem to fall into three groups.



*This work was done in co-operation with the Honorary Advisory Council of Scientific and Industrial Research. Mr. James W. Burns was a holder of a studentship at Queen's University for 1919-20.

1.—Very weak bases (hydroxyl ion concentration 10^{-8}), CuO, NiO, CoO, FeO, Fe_2O_3, Al_2O_3, $CoCO_3$, $NiCO_3$, $FeCO_3$.

2.—Weak bases (hydroxyl ion concentration, 10^{-9}) HgO, CdO, ZnO, Cr_2O_3, $ZnCO_3$, $PbCO_3$, $CuCO_3$, $MnCO_3$, Pb_3O_4, PbO, Cu_2O.

3.—Moderately strong bases. ($10^{-10.5}$) Ag_2O, $MgCO_3$, MgO, $CaCO_3$, $SrCO_3$, $BaCO_3$.

The strong bases were not used as the oxides are soluble.

The temperature at which the most satisfactory conditions prevail for filtering the precipitate was found to be 100°. It was not possible to take the measurements at this temperature, owing to the great difficulty in procuring an equilibrium.

From the accompanying sketch (Figure 1.) it will be noticed that a group of oxides give a hydroxyl ion concentration very nearly equivalent to the hydrogen ion concentration of thorium and cerium. It is also evident that another group of the oxides give a hydroxyl ion concentration. approximating quite closely to the hydrogen ion concentration of praesodynium and neodynium.

From the diagram it will also be noticed that cerium(-ous) lies close to lanthanum in acid hydrolysis, but when oxidised it approaches very closely to thorium. Advantage was taken of this in separating cerium from the other rare earths.

The fact of the progressive hydrolysis of the oxides and carbonates must not be lost sight of as it is by this principle that the separation can be explained. Thorium nitrate having a certain hydrogen ion concentration, on hydrolysis, requires a certain hydroxyl ion concentration, produced by an oxide or carbonate cream to precipitate it completely as the hyroxide. As fast as the thorium is precipitated the equilibrium is disturbed and more of the oxide goes into solution, is hydrolysed, and so keeps the hydroxyl ion concentration the same as before the thorium was precipitated.

Apparatus Used.

All the E.M.F. measurements were made at a temperature of 25°C within 0.01 degree by immersing the cells in a water bath kept at that temperature and controlled by a thermostat.

The voltages were determined by a Leeds and Northrup Potentiometer, (57116) and a D'Arsonval galvanometer. As a primary standard of E.M.F. a Weston Standard cell was used, (1.01868 volts at 19.5°C). A Hildebrand hydrogen electrode and a modified form of the same were used. The calomel cell was a modified form of the type devised by Fales.

The hydrogen was prepared from 1:6 sulphuric acid by the action of C.P. zinc. The purifying train consisted of sodium hydroxide, saturated solution of mercuric chloride, alkaline permanganate, acid permanganate, conductivity water, cotton wool and finally a solution the same as was being measured.

The junctions between the solutions were made by dipping the ends of a siphon, plugged with cotton wool, into a dish of 4.M KCl. Care was taken to have the liquids at the same level.

In the case of the oxides and carbonates mechanical shaking had to be resorted to and did not prove to be extremely satisfactory as the electrode soon became poisoned and had to be replatinized. The shaking device was so regulated as to give 100 shakes a minute through an angle of 10°.

The accompanying diagram gives an idea of the electrical connections and apparatus.

Earths Studied:—Thorium, Cerium, Neodynium, Praesodynium and Lanthanum. Oxides:—Lead (peroxide), Zinc, Cadmium, Ferrous, Ferric, Cupric, Cuprous, Lead (red), Lead (litharge), Mercuric, Cobaltous, Nickelous, Chromic, Stannic, Aluminum, Magnesium, Silver. Carbonates: — Lead, Zinc, Iron, Silver, Magnesium, Calcium, Barium, Strontium, Cobaltous, Nickelous, Manganous and Cupric. Standard Solutions:—Cerium Nitrate, 14.475 grams per litre; Lanthanum Nitrate, 14.4666 grams per litre; Praesodynium Nitrate, 14.4966 grams per litre; Neodynium Nitrate, 14.6100 grams per litre; Thorium Nitrate, 17.4100 grams per litre; Zirconium Nitrate, 8.8650 grams per litre.

From the above N/100 and N/1000 solutions of the nitrates were prepared.

In the experimental work the solid nitrate was weighed out and the solution made up to a volume so that it would be approximately N/10.

Materials Used and Their Preparation.

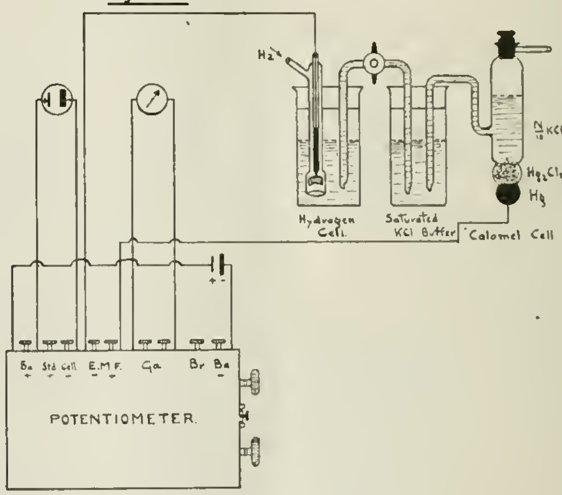
The mercury used in preparing the calomel cells was first purified by electrolysis[1] followed by cleaning with nitric acid in a special form of apparatus devised by Dr. McKee of this University (Queen's). This was followed by three distillations in vacuuo with air being drawn through. This mercury was sealed in a glass flask.

The Calomel was prepared from above by electrolysis[2]. This was placed in a liter resistance glass flask and covered with 1 N KCl, thoroughly shaken for an hour then filled to top, corked and sealed with paraffin wax.

The potassium chloride was prepared by recrystallizing "Baker's Analysed" three times from pure water and then fus-

DIAGRAM OF APPARATUS.

Figure 2.



ing. 7.456 g. was taken and made up to 1 liter with pure water. Another solution to be used as a bridge solution was made by taking 298.24 g. and making up to 1 liter. Temperature in both cases 20°C.

The rare earth salts used were procured from the Welsbach Company, through the kindness of Mr. H. S. Miner. The double salts would not give satisfactory results so the single salts were prepared. The earths were precipitated as hydroxides, washed, ignited and dissolved in requisite amount of nitric acid in presence of hydrogen peroxide, evaporated to a syrup and crystallized in a vacuum dessicator. The chlorides were prepared by passing dry hydrochloric acid gas over the ignited oxides.

The water used was prepared by distilling the laboratory distilled water with alkaline permanganate and using the middle portion to distil through a block tin condenser. This process was repeated and water bottled in resistance glass flask and sealed. One bottle was used at a time and fitted with soda lime tube.

[1] Wolf & Waters, Bull. of Bureau of Standards, Vol. 4-1907-8
[2] Ellis, J. A. C. S. 38, 740, 1916.

This water gave a concentration of hydrogen ion equivalent to $10^{-5.7}$.

The preparation of the pure oxides and carbonates presented difficulties which were almost impossible to overcome, and even with the utmost care the resulting products varied in color even though they gave identical results on being analysed. The writers would suggest that a study of the different methods of preparation of many of the metal oxides and carbonates would be of far reaching value. The carbonates were of even mcre uncertain composition than the oxides.

In this work the oxides were prepared in six ways.

1st. Ignition of the nitrates.

2nd. Ignition of the sulphates.

3rd. Ignition of the carbonates.

4th. Ignition of the oxalates.

5th. Ignition of the precipitated hydroxides.

6th. Passing pure oxygen over the hot metal.

The temperature conditions in these preparations were carefully regulated so as to produce the oxide required.

In the case of cuprous and silver oxides these methods could not be used with any success so special methods had to be used.

The carbonates were prepared by precipitation by sodium or ammonium carbonates and were washed until they were free from the precipitant. In the case of silver carbonate and iron carbonate the solutions of the carbonates had to be kept ice cold until filtered in order tc stop hydrolysis. Cadmium and manganous carbonates were much more satisfactory when prepared under the same conditions as the above.

Electro Motive Force Measurements.

The electrodes after being platinized, washed and saturated with hydrogen in pure water were used in the E.M.F. measurements.†

Ostwalds formula for calculating the hydrogen ion concentration was used,

$$E = .337 - .05816 \log. c.$$

$$\text{or } \log. 1/c = \frac{E - .337}{.05816} = \text{PH of Sorensen in which ex-}$$

pression log 1/c denotes H ion concentration.

The cells measured were of the type,

Hg—Hg Cl—0.1 M KCl, || 4 M KCl, || N/100 $Th(NO_3)_4$—Pt_H.

From the measurements obtained and applying Ostwald's formula. the following values were obtained:—

N/100 $Th(NO_3)_4$—H ion conc$^3 = 10^{-2.4349}$

N/100 $Pr(NO_3)_3$—H ion conc$^3 = 10^{-4.2380}$

N/100 $Nd(NO_3)_3$—H ion conc$^3 = 10^{4.5260}$

N/100 $Ce(NO_3)_3$—H ion conc$^3 = 10^{5.6815}$

N/100 $La(NO_3)_3$—H ion conc$^3 = 10^{6.0653}$

N/100 $Ce(NO_3)_4$—not measured owing to the fact that it reduces to the lower form of oxidation. Using indicators the H ion conc was found to be within the vicinity of $10^{-2.65}$

In measuring the hydroxyl ion concentration of the various oxides and carbonates used, an amount approximating very closely to that used in a separation was taken.

One gram of each of the precipitants was added to 100 cc. of pure water, and the whole heated to boiling, cooled to 25° and then measured. On account of the marked difference in solubility the slutions would differ much from one another in normality.

CuO	$10^{-7.16}$	ZnO	$10^{-8.84}$
$FeCO_3$	$10^{-7.60}$	Pb_3O_4	$10^{-8.92}$
CoO	$10^{-7.61}$	Cu_2O	$10^{-8.91}$
Cr_2O_3	$10^{-8.22}$	Ag_2O	$10^{-10.76}$
$CuCO_3$	$10^{-8.85}$	$MgCO_3$	$10^{-10.87}$
$MnCO_3$	$10^{-8.86}$	MgO	$10^{-10.97}$
$ZnCO_3$	$10^{-8.76}$		

†A bibliography of the work on the hydrogen electrode and related subjects is given very completely in, "The Determination of Hydrogen Ions," by W. M. Clark; Williams and Wilkins, 1920, while a very complete bibliography of the work on the Rare Earths is given in "The Metals of the Rare Earths"; Spencer-Longmans, Green & Co., 1920.

These results were obtained by measuring the E.M.F. of the various cells and applying the formula:

$$pH = \frac{E.M.F. - .337}{.05816}$$

The oxides and carbonates gave hydroxyl ion concentrations differing as much as .65, for example, CuO prepared from the nitrates, by ignition, gave as a reading for the hydroxyl ion concentration $10^{-7.21}$ and prepared by ignition of the precipitated hydroxide $10^{-7.85}$. In the case of some of the oxides very little difference was made by preparing the oxide in different ways, CdO as prepared by the writers in three ways gave readings differing in the third place. The carbonates were even less constant and so fresh material was made up for each set of determinations.

In the above table the readings are of the oxides prepared by the ignition of the nitrates. Silver could not be prepared in that manner, but was prepared by precipitating the oxide from a solution of the nitrate by sodium hydroxide. The carbonates were prepared by precipitating the carbonate from an ice cold solution of the nitrate by means of sodium carbonate. The precipitate was washed with ice cold water, cried in vacuuo and used as required.

From the two sets of measurements the possibility of making the following predictions might be expected.

1.—That certain oxides ,such as FeO, CoO, etc., having a very small concentration of hydroxyl ions would not be expected to precipitate thorium completely.

2.—That other oxides, etc., such as CdO, HgO, etc., would precipitate nearly all of the thorium, in-as-much as the hydroxyl ion concentration approaches very near to that required to precipitate thorium.

3.—That some oxides, etc., such as ZnO, CuO, PbO, Pb_3O_4, $PbCO_3$, etc., would precipitate thorium and cerium(-ic) completely and leave the other rare earths in solution.

4.—That certain oxides, giving an appreciable concentration of hydroxyl ions, such as Ag_2O, MgO, $MgCO_3$, would be needed to separate neodynium and praesodynium from lanthanum.

5.—That as lanthanum is a stronger base than ammonium hydroxide, a strong base would be needed to precipitate it completely.

In order to prove the correctness of the above a large number of determinations were carried out, and from the results a number of methods were devised to separate the rare earths from one another and from thorium.

In-as-much as neodynium and praesodynium are so nearly alike in all properties a separation of the two as hydroxides would not be expected. The writers started a fractional precipitation of the two by ammonia, but were not able to completely separate the two in the time at their disposal.

The general method of separation was to add to a boiling solution of the mixed rare earths in solution, a slight excess of the precipitant. The boiling was continued for a short time and the precipitate filtered off. The rare earths still remaining unprecipitated in the filtrate would be determined. The precipitate would be dissolved in moderately strong acid and the material used as precipitant removed, generally as the sulphide. The rare earth remaining would then be determined.

Preliminary Experimental Work.

Previous to the quantitative determinations a series of qualitative experiments were carried out to find the best conditions under which the separation could be made in order to effect a quick and accurate separation. It was found that for each precipitant different conditions were necessary. The general condition was to boil the solution and then add the precipitant. If the solution is allowed to stand for a number of hours in the cold an effective separation can be made.

The rare earths are precipitated as a heavy precipitate, which can be readily filtered off.

The filtrate from a separation with nickel or cobalt oxides and carbonates contains a double salt of the type 3R $(NO_3)_2$, 2 M cobalt $(NO_3)_3$, 24 H_2O, where R = Co, Ni, or Fe. M = rare earth.

A double salt with iron seems to be formed but the composition was not determined. Grant and James‡, isolated lanthanum ferrous nitrate.—3 $Fe(NO_3)_2$, 2 $La(NO_3)$, 24 H_2O.

In all the following tables the weight of the precipitant is only approximate.

TABLE A.

Oxide or Carbonate	Weight grams	Volume c.c.	Thorium Taken grs	Thorium Found grs	Error grams
ZnO	1.0000	100	.7224	.7226	.0002
CdO	1.0000	100	.7224	.7211	.0013
Pb_3O_4	1.0000	100	.7224	.7222	.0002
Cu_2O	1.0000	100	.7224	.7217	.0007
$PbCO_3$	1.0000	100	.7224	.7223	.0001
$ZnCO_3$	1.0000	100	.7224	.7222	.0002
$CuCO_3$	1.0000	100	.7224	.7229	.0005
$MnCO_3$	1.0000	100	.7224	.7221	.0003

The above oxides and carbonates in Table 'A' have sufficient hydroxyl ion concentration to complete the hydrolysis of the thorium nitrate.

TABLE B.

FeO	1.0000	100	.7224	.4167	.3057
NiO	1.0000	100	.7224	.3271	.3953
CoO	1.0000	100	.7224	.2871	.4343
CuO	1.0000	100	.7224	.2937	.4287
Fe_2O_3	1.0000	100	.7224	.6182	.1041
Cr_2O_3	1.0000	100	.7224	.6271	.0953

The above oxides and carbonates in Table 'B' have insufficient hydroxyl ion concentration to complete the hydrolysis of the thorium nitrate.

HgO was tried but the precipitate was so gummy that it was not used. PbO, CdO, PbO_2, gave precipitates so slow in filtering and very difficult to handle so they were not used in the quantitative determinations. Nickel and cobalt tended to double salts which were extremely soluble so they were not used.

Manganous carbonate, copper carbonate and lead carbonate were the most satisfactory in regard to condition of the precipitate and ease in filtering and washing.

TABLE C.

Precipitant	Weight grams	Vol. Sol. c.c.	Combin'd RareE'rths Ce(ous), Pr, Nd, La. Taken grs.	Fd. grs.	Loss grams
ZnO	1.0000	100	.7274	.0026	.7284
Pb_3O_4	1.0000	100	.7274	.0022	.7254
Cu_2O	1.0000	100	.7274	.0021	.7253
$PbCO_3$	1.0000	100	.7274	.0020	.7254
$MnCO_3$	1.0000	100	.7274	.0017	.7257
$CuCO_3$	1.0000	100	.7274	.0018	.7256
$ZnCO_3$	1.0000	100	.7274	.0018	.7256

No thorium or Ceric in the above experiments.

Table 'C' shows that the above precipitants have not sufficient hydroxyl ion concentration to complete the hydrolysis of the Cer(-ous), Pr, Nd, and La nitrates.

The precipitate was dissolved in 1:6 nitric acid and in most of the experiments the precipitant metal was thrown out as the sulphide. In some cases excess of soldium hydroxide was used to dissolve the metal and leave the rare earths as the hydroxide.

TABLE D.

Precipitant.	Weight grams	Vol. Sol. c.c.	Combined RareErths Ce(ous), Nd, Pr, La. Taken grams	Found in filtrate grams	Thorium Taken grams.	Nitrate Found in ppt. grams.
ZnO	1.0000	100	.5000	.4490	.2500	.2511
Pb_3O_4	1.0000	100	.5000	.4496	.2500	.2510
$PbCO_3$	1.0000	100	.5000	.4486	.2500	.2516
$ZnCO_3$	1.0000	100	.5000	.4489	.2500	.2514
$CuCO_3$	1.0000	100	.5000	.4479	.2500	.2520
$MnCO_3$	1.0000	100	.5000	.4483	.2500	.2514
Cu_2O	1.0000	100	.5000	.4468	.2500	.2522

Table 'D' shows that with mixtures of all the rare earths the hydrolysis of thorium is complete while in the case of the other earths it is minute.

The rare earths were separated and determined in the usual manner.

With these precipitants a number of methods of making quick and accurate separation of the rare earths from thorium was worked out.

As a preliminary step the solution was saturated with either sulphur dioxide or hydrogen sulphide, to reduce the cerium completely, the excess was boiled out and the experiment carried out in an atmosphere of carbon dioxide.

A.—Giles[4] used freshly prepared lead carbonate to precipitate thorium. He allowed to stand for 12 hours. This method was modified in that the solution of the rare earths was allowed to stand with a slight excess of the carbonate at 60° for 2 hours. The thorium was completely precipitated and on washing the precipitate was dissolved in the least amount of 1:6 nitric acid and the lead removed as the sulphide. The filtrate from this operation was boiled and the thorium precipitated as the oxalate, filtered, washed, ignited and weighed as the oxide.

TABLE E.

Lead Carbonate Grams.	Vol. Sol. c.c.	Thorium Taken grams.	Nitrate Found grams.	Combined Rare E'rth Ce(ous)-, Pr, Nd, La. Taken grs	Found grs
1.0000	100	.2000	.1996	.8000	.8002
3.0000	500	.5000	.5006	1.0000	.9897

The above are typical results with this precipitant.

An equal weight of all the rare earths was used in the first case.

B.—Copper carbonate was prepared by pouring a cold saturated solution of C.P. copper nitrate into an ice cold solution of sodium carbonate. The precipitate was filtered, washed with ice water and dried in vacuuo. The composition as determined was 2 $CuCO_3$, $Cu(OH)_2$.

This product was added to the rare earths in solution and the solution tested by taking out 1 cc. and testing for thorium with meta-nitrobenzoic acid[5]. When no test was given a slight excess of the carbonate was added and the solution boiled for 5 minutes. The resulting precipitate contained all the thorium and none of the other earths. The precipitate was filtered off, washed with cold water, then dissolved in 1:6 nitric acid and the whole precipitated with ammonium hydroxide, excess was added to get rid of copper. The precipitate was filtered off, washed with dilute ammonia, followed by cold water, ignited and weighed.

The filtrate was treated with ammonia in the same manner and the rare earths determined.

Hydrogen sulphide was also used to free from the metal.

TABLE F.

Copper Carbonate Grams	Vol. Sol. c.c.	Thorium Nitrate Taken grs	Found grs	Comb. Rare Earths Taken grs	Found grs
1.0000	100	.2000	.2011	.2000	.1987
2.0000	400	.5000	.4988	.5000	.5011

The above are representative results. In using ammonia a small amount of the rare earths remain in solution.

C.—Zinc carbonate prepared by pouring an ice cold solution of C.P. zinc nitrate into an ice cold solution of sodium hydrogen carbonate with stirring. The precipitate is filtered, washed and dried in vacuuo.

Method worked out is the same as with copper carbonate although just bringing to the boiling point suffices to precipitate all the thorium and leave the other earths in solution.

TABLE G.

Zinc Carbonate grams.	Vol. Sol. c.c.	Thorium Taken grs	Nitrate Found grs	Comb. Rare Earths Taken grs	Found grs
1.0000	100	.2000	.2018	1.0000	.9971
2.0000	250	.4000	.4017	1.1000	1.0980

The above are representative results.

D.—Red lead (Pb_3O_4) molecular weight 68.53 'Baker's Analyzed' was used.

To a mixture of the rare earths heated to boiling, slight excess of Pb_3O_4 was added (tested for thorium as before) boiled for ten minutes, and filtered. The precipitate was dissolved in 1:6 Nitric acid and the lead removed by hydrogen sulphide and thorium determined as before.

‡J.A.C.S., 1915, 37, 2652-54.

[4] Chem. News, 1905, 92, 130.
[5] Neish—J. Amer. Chem. Soc., 1904, 26, 780.

TABLE II.

Lead Oxide. grams	Vol. Sol. c.c.	Thorium Nitrate Taken grs	Found grs	Combined Earths Taken grs	Found grs
1.000	100	.2000	.1992	1.0000	1.0017
2.000	300	.4000	.4008	1.0000	.9988

E.—A mixture of the rare earth chlorides was used in the case of copper oxide (Cu_2O). A mixture of 5 parts, by weight, of Cu_2O prepared by the action of a solution of glucose in a solution of copper nitrate, 1 part finely divided copper and 1 part of freshly prepared cuprous chloride was added to the solution of the chlorides and the whole heated for 1 hour at 100°. The thorium was entirely precipitated and on a repetition of the process was entirely free from the rare earths, Ce, La, Pr, Nd. The presence of cuprous chloride tends to make the precipitate more compact and easier to filter. This is the oldest of all methods of separation, Lecoq de Bois Baudran having used it.

TABLE I.

Cu_2O grams	Vol. Sol. c.c.	Thorium Nitrate taken grs.	found grs.	Rare Earths Ce, La, NdPr taken grs.	found grs.
1.000	200	.1000	.1008	.2000	.1991
2.000	500	.2000	.2004	.3000	.3007
5.000	1000	1.0000	1.0003	.5000	.4994

F.—Manganous carbonate prepared by adding a cold saturated solution of manganous chloride to an ice cold solution of sodium carbonate gives a white precipitate of manganous carbonate which was filtered, washed with ice cold water, dried in vacuuo and bottled.

This material was used in the following experiments and proved to be very satisfactory. At a temperature of 64°C thorium is completely precipitated in a form that allows it to be filtered very quickly. The solution of the earths was treated with a slight excess of the carbonate, heated to 64°, filtered, washed with ice water and the precipitate re-dissolved and the process repeated. The thorium was precipitated after removing the manganese as sulphide, by either barium carbonate or a saturated solution of potassium sulphate. The process is repeated and the thorium finally precipitated as the oxalate.

TABLE J.

Manganous Carbonate grams.	Vol. Sol. c.c.	Thorium Nitrate taken grs.	found grs.	Other Rare Earths' Nitr'ts taken grs.	found gras
1.000	100	.2000	.1992	.8000	.8002
5.000	1000	5.0000	5.0026	5.0000	4.9960

G.—Zinc oxide prepared by igniting the C.P. nitrates was used and also that prepared by the oxidation of the pure metal. They were equally satisfactory. Both gave a total precipitation of the Thorium and left practically all the other rare earths in solution. The methods used is the same as with zinc carbonate. The precipitate was dissolved, and the process repeated as before.

TABLE K.

Zinc Oxide grams.	Vol. Sol. c.c.	Thorium Nitrate taken grs. grams.	Found grs. grams.	Other rare Earths' Nitrats Ce, Pr, La, Nd. Taken grs.	Found grs.
1.000[1]	100	1.0000	1.0024	.5000	.4971
1.500[2]	150	1.0000	1.0036	.5000	.4957
2.000[1]	200	2.0000	2.0092	1.0000	.9901
2.500[2]	500	5.0000	5.0097	3.0000	2.9900

[1]—Zinc oxide prepared from the metal.
[2]—Zinc oxide prepared from the nitrate.

Zinc is not so satisfactory as the other metals as it carries down some of the other rare earths. It is also hard to get rid of and so makes a rather tedious separation.

Tables 'E', 'F', 'G', 'H', 'I', 'J', 'K', show that the hydrolysis of thorium nitrate is completed and that thorium is precipitated quantitatively, while the other rare earths remain in the filtrate.

Cerium.

The solution freed from thorium and containing lanthanum, praeseodynium, neodynium, and cerium was treated in the following manner in order to remove the cerium as ceric hydroxide and leave the others in solution.

I.—The solution was made distinctly pink with potassium permanganate, boiled and the cerium precipitated by means of copper carbonate, manganous carbonate, lead carbonate or zinc carbonate. The conditions were the same as in the case of thorium, and the determinations were carried out in that way.

TABLE L.

Precipitant	Vol. Sol. c.c.	Cerium Nitrate Taken grs.	Found grs.	Other rare Earths' Nitrate Taken grs.	Found grs.
$CuCO_3$.....	400	1.0000	1.0007	1.0000	.9992
$PbCO_3$.....	400	1.0000	1.0001	1.2500	1.2496
$ZnCO_3$.....	400	1.0000	.9996	1.5000	1.5006
$MnCO_3$....	400	1.0000	.9997	2.0000	2.0004

II.—The solution containing cerium, lanthanum, praesodynium and neodynium is heated to 70° and pure hydrogen peroxide added. To the hot solution, a slight excess of either lead carbonate, zinc carbonate, copper carbonate or manganous carbonate is added and the whole heated to 70° for 2 minutes. The cerium is precipitated entirely while the other earths are not. The precipitate is dissolved and the metal removed as before. The determination of the cerium and the other rare earths is carried out as with thorium.

TABLE M.

Precipitant.	Weight grams.	Cerium Nitrate Taken grs	found grs	Comb. rare Earths taken grs	found grs	Vol. Sol. c.c.
$PbCO_3$...	2.000	1.0000	.9996	1.0000	1.0008	400
$ZnCO_3$...	2.000	1.0000	.9999	1.0000	.9996	400
$CuCO_3$...	2.000	1.0000	.9992	1.0000	.9992	400
$MnCO_3$..	2.000	1.0000	.9994	1.0000	.9995	400

Tables 'M' and 'N' show that if cerium is in the ceric condition the hydroxyl ion concentrration of the above precipitants is sufficient to complete its hydrolysis and precipitate it completely and leave the other three earths in the filtrate.

III.—To the cold solution containing lanthanum, neo-dy nium, praesodynium and cerium, an ice cold solution of sodium peroxide is added with stirring. The cerium is precipitated as ceric hydroxide[6].

Barium and calcium peroxides were substituted and cerium was precipitated as before, filtered, washed with ice water, ignited and weighed as CeO_2. The other rare earths in the filtrate were precipitated as the oxalates, washed, ignited and weighed.

TABLE N.

Precipitant	Vol. Sol. c.c.	Cerium Nitrate Taken grs	Found grs.	Rare Earths, La, Pr, Nd. Taken grs.	Found grs.
Na_2O_2.....	1000	1.0000	1.0009	1.0000	.9991
CaO_2......	1000	1.0000	1.0011	1.0000	.9986
BaO_2......	1000	1.0000	1.0007	1.5000	1.1488

In connection with III, it will be noted that these are soluble oxides, but the methods are of importance so are included.

Lanthanum.

From the measurements of the hydroxyl ion concentration silver oxide would be expected to precipitate all of neodynium and praesodynium and if in excess a little of the lanthanum. Magnesium oxide and magnesium carbonate would be expected to do the same to a slightly greater extent. Magnesium oxide[7] precipitates a considerable portion of the lanthanum, magnesium carbonate less and the silver oxide even less. A carbonate of silver was prepared and it gave an excellent separation but on account of its indefinite composition and difficulty in preparing was only used in a few separations.

The following methods using these precipitants were devised:

A.—Magnesium oxide (Muthmann and Rolig)—A slight excess of MgO is added to the solution (test a small portion of the liquid for the absorption spectra or evaporate 1 cc. and make a borax bead) and the solution heated to 60° for two hours, filtered, washed and then dissolved and the neodynium and praseodynium removed by a saturated solution of potassium

[6]Mengel-Zeitsch Anorg. chem., 1893-4-1-9.
[7]Muthmann and Rolig Ber. 1898-31-1718.

sulfate. This is dissolved up and precipitated as the hydroxide, washed, ignited and weighed as Nd_2O_3. The filtrate is treated in the same manner and weighed as La_2O_3.

B.—Magnesium carbonate is used and the solution kept cold being allowed to stand for 4 hours. In all other particulars the method is identical with the first.

C.—Silver oxide, freshly prepared, is used and the solution brought to the boiling point and quickly filtered. The precipitate is dissolved in 1:6 nitric acid and the silver precipitated by sodium chloride. This is filtered off and the rare earths precipitated as before and determined. The original filtrate is treated as before and the lanthanum determined.

Table O.

Precipitant.	Weight grams.	Vol. Sol. c.c.	Rare Earths, Nd. Pr.		Lanthanum Nitrate	
			taken grs.	found grs.	taken grs.	found grs.
Ag_2O....	1.000	100	1.0000	1.0019	1.0000	.9987
(Ag_2CO_3).	3.000	500	3.0000	3.0007	3.0000	2.9984
MgO....	3.000	1.000	2.0000	2.0098	2 0000	1.8999
$MgCO_3$..	1.0000	100	1.0000	1.0022	1.0000	.9974

Table O shows that the above precipitants give an hydroxyl ion concentration sufficient to complete the hydrolysis of Nd, and Pr, and to precipitate them quantatively and not lanthanum.

The ordinary laboratory chemicals such as lead oxide (red), manganous carbonate, copper carbonate, lead carbonate and zinc oxide were tried as a precipitant for thorium and cerium (ceric).

Table P.

Precipitant	Vol. Sol. c.c.	Thorium and Cerium		Rare Earths, La, Nd, Pr.	
		Taken grs.	Found grs.	Taken grs.	Found grs.
$MnCO_3$....	200	1.0000	1.0032	1.0000	.9971
$CuCO_3$.....	200	1.0000	1.0028	1.0000	.9976
$ZnCO_3$.....	200	1.0000	1.0076	1.0000	.9921
ZnO.......	200	1.0000	1.0178	1.0000	.9870
Pb_3O_4......	200	1.0000	1.0102	1.0000	.9900
$PbCO_3$.....	200	1.0000	1.1000	1.0000	.9001

Laboratory magnesium oxide and magnesium carbonate were used as a precipitant for neodynium and praesodynium. It was found that a large part of the lanthanum was precipitated as well unless the excess of the precipitant was carefully regulated. This was especially true in the case of magnesium oxide.

Table Q.

Precipitant	Vol. Sol. c.c.	Neodynium and Praesodynium			Lanthanum
		Taken grs.	Found grs.	Taken grs.	Found grs.
MgO......	100	.5000	.6781	.5000	.3212
$MgCO_3$....	100	.5000	.6121	.5000	.3872

Neodynium and Praesodynium.

The difference in basicity of these earths is so slight that a separation based on the difference in the basicity is impossible. Hildebrand[8] states that he found they could not be separated even by a partial fractionation. Evidence seems to be that a long series of fractionations by ammonia will give a separation. Starting with equal quantities of each 30 fractionations gave a slight separation, and judging from these at least 500 would be needed to separate the two.

A Scheme for the Separation of the Cerium Group of Rare Earths from one another and from Thorium.

Th, Ce, Nd, Pr, La, as nitrates.

The solution is treated with H_2S or SO_2 to reduce cerium to the cerous condition. The excess is boiled out and the solution treated in an atmosphere of CO_2 with either $PbCO_3$, $ZnCO_3$, $CuCO_3$, Pb_3O_4, or ZnO in slight excess. The solution is filtered.

1.—The precipitate contains thorium as the hydroxide. The precipitate is dissolved up and the metal removed. The thorium is then precipitated as the hydroxide, washed, ignited and weighed

[8] J.A.C.S., 35, 1913, 865.

2.—The filtrate from 1. contains Ce, La, Nd, and Pr. The filtrate is treated with a small amount of $KMnO_4$, slight pink, and then solution heated to boiling and a slight excess of either $PbCO_3$, $MnCO_3$, $ZnCO_3$, or Pb_3O_4 is added with stirring and the solution quickly filtered.

3.—The precipitate from 2 contains the cerium as ceric hydroxide. The precipitate is dissolved and the metal removed. Cerium is then determined as in the case of thorium.

4.—The filtrate from 3. contains Nd, Pr, and La. Treat the filtrate with a slight excess of MgO, Ag_2O, or $MgCO_3$. The solution is not to be boiled, heated only to 60°. The solution is filtered.

5.—The precipitate from 4. contains Nd, and Pr. The precipitate is dissolved and metal removed and the solution subjected to a fractional precipitation with ammonia.

6.—The filtrate from 5. is treated with sodium hydroxide and La determined as in case of thorium.

Summary.

1.—The hydrogen ion concentration of N/100 solution of the nitrates of cerium, lanthanum, neodynium, praesodynium and thorium has been measured. The order of these rare earths in regard to the hydrogen ion concentration is thorium, cerium (-ic), neodynium, praesodynium, cerium(-ous) and lanthanum.

2.—The hydroxyl ion concentration of a number of oxides and carbonates practically insoluble in water, has been measured.

3.—Based on these two sets of measurements methods have been devised to separate the above earths with the exception of neodynium from praesodynium.

4.—The impossibility of separating neodynium and praesodynium except by a long series of fractional precipitations.

5.—A comparison has been made of pure oxides and carbonates and the ordinary commercial product, as a precipitant of the rare earths.

6.—A scheme for a rapid and accurate separation of the cerium group of rare earths from thorium and from one another (except Nd, Pr) has been devised.

Chemical Laboratories,
Queen's University,
Dec. 1920. Kingston, Ont.

POTASH SYNDICATE WILL NOT ALTER ITS POLICY.

Rumors emanating from Washington which have received no little publicity, to the effect that the German Potash Syndicate would shortly be broken up and the American buyers deal directly with the producing firms in Germany and not through the syndicate, seem to be somewhat premature. According to reliable sources of information there has been no agitation in any quarter for the breaking up of the syndicate. While the present market for potash at the prices which are being asked by the German interests is practically dead, there are buyers who state that they are doing business with these interests, and that they have been assured that supplies will continue to be available through the syndicate during the coming year. The association has not changed its prices nor its policies with regard to the sale of this important material. It is believed, however, that the syndicate may shortly be obliged to reduce its prices on account of the fact that the French prices are such that the sale at the higher levels is impossible. Sources of information which were interviewed stated that they were able to authoritatively deny the Washington reports.—Journal of Commerce.

The Chemical Engineer and the News-Print Industry*

The Function of the Chemical Engineer in the Pulp and Paper Industry---The difficulties He Has Met With in Establishing Technical Control and Efficient Methods ---The Breakdown of the Old "Rule of Thumb" System

By R. W. McKENZIE†

A DECADE ago courses of Chemical Engineering in Canadian Universities were in their infancy. To-day, Chemical Engineers are in demand and a good percentage of the science students are taking the course. The reason for adding another engineering course was to provide the growing Chemical Industries with engineers who have a real working knowledge of Industrial Chemistry. These Chemical Engineers have proven that the course was a step in the right direction as they are better able to cope with the troubles arising in the Chemical Industries, than the chemist with no knowledge of engineering or the engineer with only a smattering of chemistry. Canada's chemical industries are growing as never before. As an example consider the newsprint industry in Canada. A few years ago we were not exporting any news-print to speak of and at the present time the Canadian mills are supplying over 30% of the news-print requirements of the United States, which is about 700,000 tons, besides taking care of a larger demand at home.

At the news-mills where they start with the raw material, the wood, and treat it until they have the finished newsprint, they have plants that are costly and large numbers of men are employed to operate these plants. In the year 1919, the pay-roll of 99 large mills (mostly news-mills) in Canada, amounted to well over $32,000,000 and the cost of plant and machinery has been many millions. The Chemical Engineer functions in these extensive plants by eliminating waste and controlling variables and thereby aiding the operators to get the best efficiency out of the equipment and men. Newsprint is made from groundwood pulp and sulphite pulp. Temporary color is added to get a whiter sheet and alum is also added to make an even texture. There is 80% of groundwood used and 20% of sulphite or chemical pulp. The wood is taken into the wood room and barked. From the barkers, it goes either to the grinder room or to the chippers. In the grinder room it is ground by sandstones into pulp which is called mechanical or groundwood pulp. The wood going to the chippers is cut into chips about 5/8" long. These chips are then screened and put into steel digesters. The chips are covered with acid. Steam is then turned on and the chips are "cooked," the "cooking" process dissolves out the pitch and gum and leaves the fibre of the wood. The content of the digesters is blown into a tank where it is washed. From here the fibre is passed through a battery of screens and pumped to the mixing room. The groundwood pulp, after leaving the grinders, is also screened and pumped to storage tanks in the mixing room. In the mixing room the sulphite and groundwood pulps are mixed in the desired proportions and pumped to the paper machines. At the paper machines the mixed stock flows on to a wire belt. As the wire carries the stock along, some of the water passes through the wire and the stock mats into a wet sheet of paper. More of the water is sucked out by suction boxes over which the wire runs. From the wire the wet sheet is placed on a woolen felt which carries the paper between several press rolls where more of the water is taken out. From the press felt the sheet is taken by a drier felt around a series of cylinders containing steam, and here the balance of the water is taken out. The paper is calendered and when it runs off the calenders onto the reel at the end of the paper machine, it is the finished news-print ready to be cut, wrapped and loaded into the cars.

"Rule of Thumb" Methods Typical Examples.

One of the troubles of the operator is to have pitch or gums of the wood get onto the wires and felts of the paper machines. This pitch fills the openings in the wire screen and does not allow the sheet to form properly, with the result that the paper "breaks" and this plays havoc with production. In one mill, the production had dropped considerably on account of having many so-called "breaks" and the manager wanted to know what was causing the trouble. The paper machine superintendent stated it was pitch, but did not know whether it was pitch from the sulphite mill or pitch from the groundwood mill. The man in charge of the sulphite mill was called in and he stated that there had not been any change made in his department so that the pitch could not have possibly come from his mill. The groundwood foreman was equally sure that nothing unusual had occurred in the grinder room so that the pitch did not come from the groundwood. Needless to say, the manager was not enlightened, as it seemed a case of "passing the buck." To-day the Chemical Engineer is stopping that sort of stuff. When a technical man got on the job, it was found that the cause was back in the acid plant of the sulphite mill. Due to a change in the acid plant the chips had been cooked improperly and as all the pitch had not been dissolved out, it was impossible to wash it out of the stock and it was carried through to the machine room and had gummed things up. These irregularities and the resulting loss in production cost the companies sufficient money to pay the salary of the technical man over and over.

In grinding, the wood is held by a ram against the rotating sandstone and during the process heat is evolved. Water is added to cool the stock, but as the temperature of the water is higher in the summer the stock is warmer then. A paper mill superintendent was having trouble with his machines and he blamed it on the hot stock. The grinder foreman was taken to task for changing his operations in the grinding process, but as the weather was warm he agreed that the stock was hot but that the paper machines had been running on hot stock for over a month, and the trouble had only lasted a few hours. Here again the management was "up a tree." The technical department settled the argument as far as the hot stock was concerned by placing a recording thermometer on the groundwood stock and charting paper mill production against temperature. It was found that the tem-

*First of a series of four articles dealing with the functions of the Chemical Engineer in different branches of the pulp and paper industry. (Copyright applied for by Westman Press, Ltd.

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perature of the groundwood stock in that mill did not affect production. The operator is not entirely at fault for blaming this or that for his troubles, as in the past he had to guess what was wrong and had to try everything he had ever done before and if that did not clear up the difficulty, why it was natural that some other department was to blame. The technically trained man delves right into the whole process and from investigation and study ties in the loose strings as it were, with the result that production runs nearer a straight line.

How One Chemical Engineer Broke In.

Before "rule of thumb" methods went down for the count, a technically trained man, seeing the possibilities there were in the pulp and paper industry for his services, endeavored to procure employment in one of the mills. The management could not see that a man, who had not grown up with the business, could be of any assistance in solving problems that they had stumbled over for years. The Chemical Engineer donned the overalls and got a job in the yard. By observation he lined up a waste in one of the departments of the mill and worked out the solution. Going back to the management this time with his solution, it was seen that this man could do something for them. It was a start in that mill and they have a well organized staff of technical men now. Some executives were far-sighted and obtained technically trained men. But even then in some cases the engineers were handicapped by not having adequate equipment with which to work out the problems. Sometimes finances were scarce and sometimes faith was lacking. At one mill, a technical department was established and the only available location for a laboratory was over the acid plant. There was only one redeeming feature in connection with this and that was that in order to make the place at all habitable, the technical department devoted most of the time to stopping sulphur dioxide leaks. Otherwise the laboratory was of no use. There was too much vibration for accurate work even when the acid maker left the plug in the gas line. There was sufficient gas in the air to throw the chainomatic balance out and it had to be moved to another corner of the plant. The practical man usually looked with suspicion on the investigations of the Chemical Engineer as he seemed to think that the technical man wanted his job. This feeling can be fought down but not before obstacles are put in the way of the Engineer so that expensive investigations have to be scrapped. In some cases it was found that the practical man was not competent and was just holding his job because his results were covered by the work of good men. Some times the men lagging behind would be willing to be shown the right way and they would develop into efficient workers. One of the acid-makers who was continually showering the laboratory with gas when it was first started, on being shown how he could improve the operation and also "eat" less gas, became later, one of the boosters of the technical department. In all industries it is much the same, the practical man distrusts the technical man as he thinks the secrets of his trade, may be lost, but when they are shown that their so-called secrets are well-known and need improving, the attitude changes.

The Way Paved.

The technical men in the pulp and paper industry have done great work in cutting down wastes and eliminating variations and the executives realize that they are as essential to efficient operation as the operators. No matter how hard the chief executive would ride his superintendents and foremen, it did not bring the improvement that the technical men have been able to bring about when they have been given the co-operation of the management and the operators. The managers are showing by the up-to-date laboratories that they are providing that they are willing to co-operate with the technical men and give them time and equipment to work out the difficulties. "Rule of thumb" methods and "passing the buck" are rapidly becoming things of the past in the pulp and paper industry.

The Chemical Engineer in the Personnel.

Some of the executives of our industries rise from the office or selling end of the game to the chair of managers. These men cannot hope to start and learn chemistry and engineering. They haven't got time. They may try to grasp all the details of the chemical reactions but it will be hard work as they lack the fundamental grounding in the principles of the science. This type of manager has instead a technical assistant and he is as valuable to him as is his operating superintendent. In some mills a technical man is attached to each departmental superintendent. This places a certain amount of routine on the shoulders of the engineer when he should be free to carry on investigations. If the superintendent has a problem he can better turn it over to the Research or Technical department and let them investigate it in a real way than have the operator attempt to tell the investigator how to go ahead and probably tie one of his hands in so doing. Some of the technical men make good operators, but it is not practical to be an operator and investigator at the same time.

Few Canadian Paper Mills "In the Old Rut."

Most of the mills in Canada have come to look upon a technically trained man as a very essential unit in a complete organization. But if any of our chemical engineers desire to pioneer a laboratory in the pulp and paper industry, it is still possible. You can still have attacks of sulphur dioxide gas when you go into the acid plant to make some investigations or probably you can work under conditions where it is thought that a pencil and a roll of news-print comprise sufficient equipment. But the mills in Canada offering such inducements are in the minority and it is to be hoped that when they decide to get the highest efficiency out of their plant and men, that they will first visit some of the really up-to-date plants and see what is necessary in order that the technical men can produce results.

EXPORTS OF COAL FROM UNITED STATES INCREASE IN VALUE

Coal exports from the United States in 1920 were $432,000,000 in value, against $169,000,000 in 1919 and $92,000,000 in the year before the war—the calendar year 1913. These figures, says a statement by the National City Bank of New York, include the anthracite and bituminous coal exported to all parts of the world plus the bunker coal supplied at United States ports to vessels engaged in the foreign trade. The value of bituminous coal sent to foreign countries in 1920 was $301,000,000 against $84,000,000 in the calendar year 1919, and $45,000,000 in the year preceding the war. Anthracite exports were valued in 1920 at $46,000,000, against $37,000,000 in 1919 and $22,000,000 in the year before the war; and bunker coal supplied to vesssels engaged in foreign trade in 1920 was valued at $82,000,000, against $48,000,000 in 1919 and $25,000,000 in 1913.

The Reclamation of Metals from Foundry Waste

Description of Reclaiming Processes for Recovery of Metal from Foundry Wastes

By J. P. NORRIE*

IN the melting of brass and copper bearing metals for manufacture of rod, tubing, wire, sheet and castings, the metal is largely melted in crucible pit fires, using anthracite coal or coke as fuel. In the melting a certain percentage of the metal is spilled over the side of the crucible when stirring or in adding metal to the crucible. This metal gets into the cinders and must be reclaimed along with products such as skimmings, sweepings, foundry sand, etc., all containing metal in various proportions.

The writer has had experience in the design and operation of several of these plants and a description of two of them with flow sheets of the processes may be interesting. It will be noticed that the machinery used and the methods are much the same as that applied to the recovery of the metals when they came originally from the earth, and comprise wet concentration and a combined process of melting and oxide smelting generally in oil fired blast furnaces and sometimes in cupolas or coke

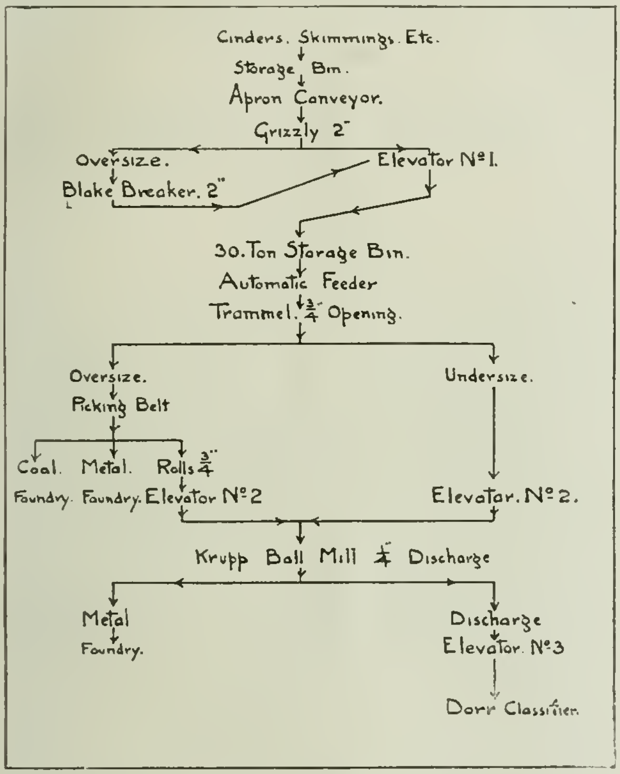

Fig. 1.

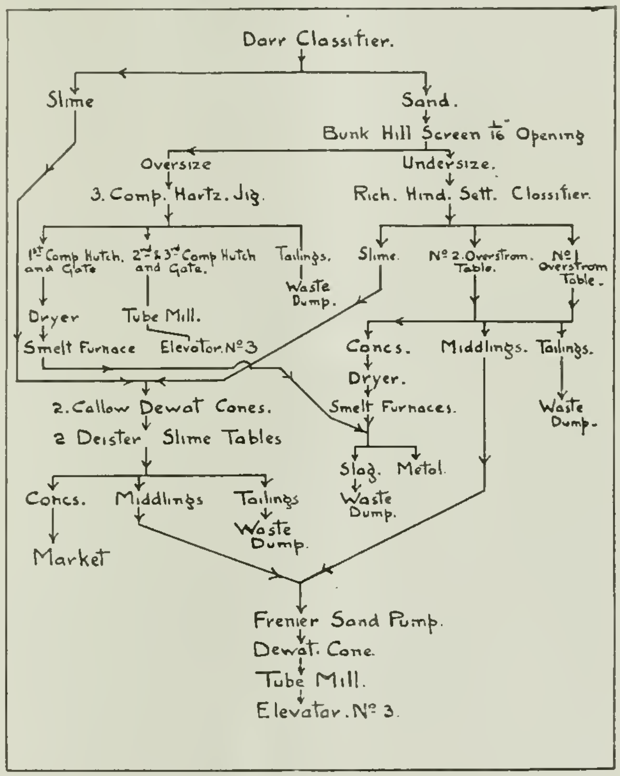

Fig. 2.

Diagrams Showing Reclaiming and Smelting Process of the Rome Brass & Copper Co., Rome, N.Y.

fired blast furnaces. In the latter the zinc and other volatile metals are almost entirely lost.

In the oil melting furnaces we do not have any cinders but quite a lot of skimmings is made which, aside from a small amount of oxide, contains generally 50% of its weight in metallics.

The electric melting furnace is fast replacing the two processes mentioned above. From this furnace we have very little metal to be reclaimed, and a much better metal for working is obtained. Before the war the reclamation of Canadian foundry waste was done mostly in the United States, but during the latter years of the war an embargo was placed on the export of this material from Canada, and plants were erected in this country to reclaim the metal contents.

The amount of material in Canada being small, even in war time, it did not warrant the erection of efficient and up-to-date plants and after the armistice and the lifting of the embargo much of the material again found its way across the border, where it could be treated more cheaply and with higher recovery in the larger plants.

The electric melting furnace, with proper control of fluxes, will no doubt be an efficient and cheap medium for recovery of metal from concentrates.

Reclaiming Process as Carried on at Rome, N.Y.

The reclaiming and smelting process as carried on by the Rome Brass & Copper Co., Rome, N.Y., is as follows:

In this plant all brass and copper are melted in crucible pit fires, and are cast in chill moulds for manufacture of sheet, rods of various shapes, wire, etc. No sand castings are made. The product to be reclaimed is about twenty-five tons per day of cinders averaging 12—15% copper and two tons of skimmings averaging 45% copper. Of course the copper contents of the product depend upon the care exercised by the melters and furnace men. The cinders from ash pits are carried in one ton buckets by monorail and are dumped into a bin. An apron conveyor conveys the material up into the plant and deposits it on a grizzly with 2" between bars. The oversize is crushed

*Supt. Electro Tin Products, Limited, Brantford, Ont.

in a Blake breaker to two inches and along with undersize is elevated by belt and bucket elevator to a thirty ton storage bin. This unit of the plant is operated by one motor independent of the remainder of the plant.

The material from storage bin is fed by automatic feeder into a trommel with ¾" opening. The oversize from trommel goes over a twenty-five foot picking belt where any unburnt coal and coarse metallics are removed, then reduced to ¾" with crushing rolls and joining the undersize are elevated by bucket and belt elevator high enough to be fed to two Krupp ball mills.

The Krupp ball mills operate alternately, and discharge ¼" material. After an accumulation of about one ton of the metallics above ¼" inside the mill the feed is switched to the other mill while the former is run with water until the product is clean enough to be removed. This product is practically pure and goes direct to the foundry. The discharge from the Krupp mills is elevated to a Dorr classifier. The sand from the classifier goes to a Bunker Hill screen with 1-16" opening. The oversize from the Bunker Hill screen goes to a three compartment Hartz jig. The gate and hutch products from first compartment carrying about 75% metallics go to the concentrate bins. The gate and hutch from the other two compartments are reground in a tube mill with steel balls, the discharge going by elevator to a Dorr classifier and back through the circuit. The tailings from the jig go to dump carrying .40% metallics.

The undersize from the Bunker Hill screen enters a two spigot Richards hindered settling classifier, the classified sand being delivered to two Overstrom tables, with stroke regulated for the two sizes to be concentrated. The slime from B.H.S. classifier joins the slime from the Dorr classifier and after being dewatered in two Callow settling cones is treated on two Deister slime tables. The Overstrom concentrates carrying 50% metallics go to the concentrate bins, while the Deister concentrates carrying 35% metallics are sold. The middlings from Overstrom and Deister tables are elevated by a Frenier sand pump to a small dewatering cone before being admitted to the tube mill for regrinding.

The tailings from the Overstrom tables carrying 17% metallics and from the Deister tables carrying 2.8% metallics, go to the dump. The tailings containing .75% copper or 1.07% metallics leave the plant through a common launder and are sampled every fifteen minutes by an automatic sampler.

The concentrates from the jig and Overstrom tables are mixed, dried and smelted in Schwartz oil fired furnaces with borax and fluorspar as fluxes.

Analysis of mixed concentrates:—

Copper	62.20
Iron	.45
Zinc	27.70
Coal	.30
Silica	8.00
Moisture	1.35

Each heat of about one ton of concentrates smelted in the Schwartz furnaces is kept separate and analyzed before returning to the foundry for re-use.

Successful experiments for the recovery of the .75% copper in the tailings by regrinding, leaching with ammonium carbonate, and distilling the resulting solution, and producing copper oxide, were carried on whereby the copper contents of tailings were reduced to .15%, but due to the small amount of material available the additional plant was never installed.

Description of Reclaiming Process of Hamilton, Ont., Plant.

Following is a description of the plant erected by the Monarch Metal Co. at Hamilton, Ontario, for treating their cinders, skimmings, sweepings, etc., from the manufacture of copper bearing castings and ingots and also similar waste from other Canadian foundries with a capacity of ten tons per day of ten hours.

The material is removed by hand from cars or ash pits and dumped over a grizzly with bars two inches apart. The oversize from grizzly is crushed to two inches in a Blake breaker and with undersize is elevated to a ten-ton storage bin. The material from bin is fed automati-

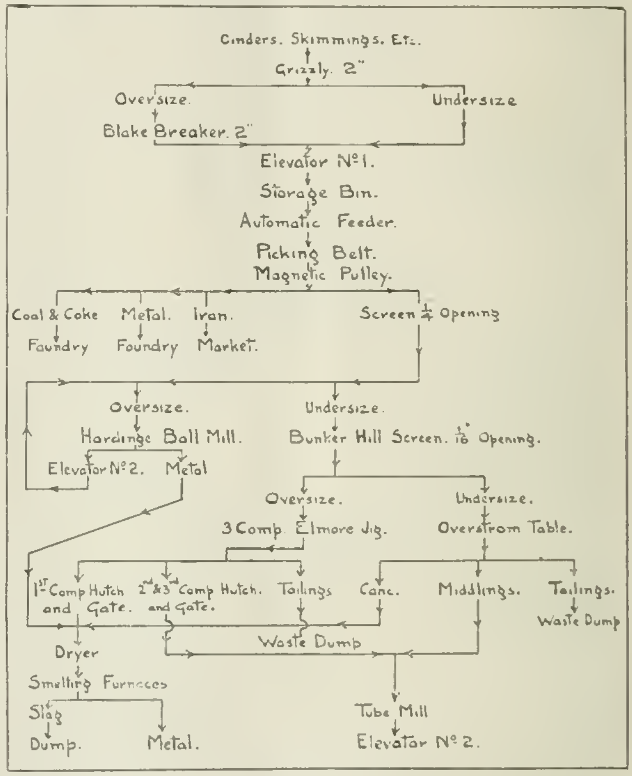

Fig. 3.

Diagram Showing Reclaiming Process at Monarch Metal Co., Hamilton, Ont.

cally to a picking belt where unburnt coal and metal is removed. The drive pulley of the belt is magnetic and all core wires and iron are removed. The removal of the iron core wires at this point is unique and saves a heap of trouble at the jig which follows. The wires otherwise would be found as an entangled mass in the bed of the jig, preventing efficient work and gate discharge of concentrates. From the picking belt the material passes into a trommel with ¼" opening. The oversize from the trommel goes to a Hardinge ball mill which is in closed circuit with it, i.e., the discharge from the Hardinge mill is elevated to the trommel.

The undersize from the trommel passes to a Bunker Hill screen with 1-16" opening. The oversize from the trommel goes to a three compartment Elmore jig. The hutch and gate products from the jig go to the concentrate bin and contain about 75% metallics. The hutch and gate products from the other two compartments flow by gravity to a small tube mill for regrinding. The tail-

ings run to the waste dump, carrying about .40% metallics. The undersize from the Bunker Hill screen goes to the Overstrom sand table. The concentrates from the table go to the concentrate bins, carrying 55 to 60% metallics. The middlings are reground and returned to the circuit. The tailings, carrying about 2.25 metallics, go to the waste dump.

The quantity of slime is so small for the size of plant that no provision was made for the same, thus giving the table tails a higher metallic content.

The concentrates from the jig and table are mixed with borax and fluorspar as fluxes and smelted in Schwartz oil fired furnaces, each heat being analyzed before use in the foundry.

Analysis of mixed concentrates:—

Copper	65.00
Iron	.35
Zinc	28.50
Silica	5.50

The loss of metal in tailings is 1.7 %.

In a comparison of the two plants, it will be noticed that the grade of concentrates in the Canadian plant is slightly higher, making for cheaper smelting, but the loss in tailings is materially greater. However, I believe the saving in freight should more than overcome this loss in most cases and should lead to the treatment of foundry waste within our borders.

The loss by volatilization of zinc, which is at least 5% when smelting in oil fired furnaces and often approaches 10%, would be almost totally overcome by the use of the electric smelting furnace, and at the same time a metal free from oxide would be produced. The use of iron silicate slags has always been scorned in smelting concentrates of this nature, fearing a reduction of iron, while the use of fluospar as a flux gives a clean fluid slag, it rapidly eats away the acid lining of the furnace and is a serious problem for the small Canadian plant. I believe that with careful control of slags a slightly acid calcium-iron silicate could be used to better advantage giving ten times the life to the acid furnace linings without a serious loss of metal in the slag, and with little or no reduction of iron.

Industrial Alcohol Status in Canada*

NOW that an Act of July 1920 has modified the Canadian Inland Revenue Act respecting the manufacture of industrial alcohol, greatly to the benefit of producers and consumers, the salient facts relating to this industry, which is of great present importance and has still greater possibilities, are of pressing interest.

Among the many substances classed as alcohols, attention is drawn to two only, viz., ethyl alcohol (C_2H_5OH) and methyl alcohol (CH_3OH). Ethyl alcohol, familiarly known as "alcohol," is a potable drug, essential to research and medicine in a pure state, if not to health and happiness. Methyl alcohol, known as wood alcohol, is a poison and can therefore only be sold by druggists under a skull and crossbones label.

When the word alcohol alone is used it means ethyl alcohol, and owing to the ease with which this can be produced and the great range of its sources, is of far more importance than methyl alcohol, which is derived from limited material, is more costly to produce and as a fuel has a net calorific power value of 4,622 net calories compared with the 6.362 from alcohol proper.

Alcohol can be produced from any organic or other substance which contains fermentable sugar or some component which can be converted into such. In other words it is obtained from anything containing carbo-hydrates such as sugar, starch, or cellulose and from inorganic substances such as acetylene by synthetic processes. It may therefore be produced from such different things as watermelons, rotten potatoes, sawdust and coke oven gas.

Its uses are nearly as varied as its sources. In a pure form it is indispensable in hospitals and laboratories, and in the making of all kinds of drugs and chemicals. In less highly rectified form it is widely needed for dyes, explosives, soaps, photo films, shoe polishes and innumerable other purposes. As a solvent in the paint and varnish industry wood alcohol is used to about 90 per cent, of its production, the towns where furniture is made testifying all too strongly to the poisonous effects of this chemical.

It is clearly then a great handicap to production generally that the cost of such a necessary ingredient should be abnormal and this is the cause of the modification of the Canadian Inland Revenue Act. Germany, in which country the use of industrial alcohol was very largely developed, promoted its manufacture by the expedient of taxing the distilleries of potable spirits and using the proceeds as a bonus for the production of non-potable alcohol. The problem, however, is to devise a method whereby this cheap necessity, alcohol, can flow into industrial channels without trickling aside into the human mouth.

In Canada a quintette of brains has made an attempt to officially solve this problem so far as social conditions and needs of revenue permit. The extraordinary efforts in the cause of temperance in addition to the natural desire to increase the revenue from alcoholic liquids, in the assurance that no amount of excise duty will dry up at least this perennial fount, have their effect in the present price of alcohol which is not less than two thousand per cent. above the cost of production. The cost, however, for industrial purposes, is brought down to a more reasonable figure by "denaturants," i.e., the adulteration of the tempting fluid by an ingredient that cannot be swallowed with pleasure or impunity. What the denaturant should be was no easy question. It had to fulfil the conditions of being deterrent in taste and smell, non-poisonous, not removable at commercial cost, readily detected in small quantities, readily mixed with the spirit, and finally inexpensive. Up to July 1920 the only denaturant allowed was methyl alcohol which had other disadvantages besides being expensive; benzol, nitro-benzol and pine oil, which are far cheaper, can now be used and, as the Act provides, render the alluring liquid in the judgment of the Minister "non-potable" and prevents its "recovery."

Under the new conditions the consumption of industrial alcohol will no doubt exceed the present two million gallons and the exports may exceed the three hundred and

*Prepared by Natural Resources Intelligence Branch, Department of the Interior, Ottawa.

twenty-seven thousand of 1919, so that those interested in the industry may be assumed to be searching for other sources of alcohol other than the foodstuffs on which they have for the most part relied.

But a far wider use for alcohol than any above mentioned, namely, its use as a motor fuel, thrusts itself on the imagination of every economist, and has been a subject of investigation by such bodies as the Imperial Motor Transport Council of Great Britain, the Advisory Council of Science and Industry in the Commonwealth of Australia, and the Agricultural Department of the United States of America.

The reason for inquiry is that the rise in the price of petrol or gasoline has reached a point at which a competitor can be a rival in the market, provided that production is unhampered and the volume of supply ample. Every known source of alcohol has been looked into, from rice straw in India to tuberous plants from the Andes.

Alcohol or Gasoline?

Without, however, committing ourselves to the statement that three hundred million gallons of alcohol must be produced yearly if the demand for gasoline or petrol is to be materially affected, it is plain that the raw material must be of a kind that exists in vast quantities, and is proved to be of less value for other purposes. Under this latter condition the chief source of alcohol up to the present time, namely molasses, maize, grains and potatoes must be ruled out, for the world under present conditions certainly cannot afford to convert any considerable amount of its sustenance into flame.

The materials, whether primary or secondary, existing in Canada for production of fuel alcohol in large amounts may, therefore, be reduced to five or six, namely, peat, straw, calcium carbide, coke-oven by-products, wool waste and waste sulphite liquor. From these the calcium carbide source may perhaps be eliminated, for although Canada has unlimited reserves of the basic materials, coke and limestone, the products of calcium carbide are more valuable directly as a fertilizer or for other purposes than indirectly as fuel. Nor is the cost of production low, though a Swiss firm is said to have contracted in 1917 to supply the alcohol from carbide at 38 cents a gallon. The proximity of considerable water-power is especially important as an element of cost in this process.

The variations in the working cost of alcoholic production are not, however, by any means a true test of economic cost. It is stated that fermentation of peat produces alcohol at 6 cents a gallon (1918), that sawdust yields it at 10.8 cents (1909), coke oven gases at 50 cents, and waste sulphite liquor at from 18½ to 32 cents (1917). Other considerations are sometimes more important than cost of process, for instance, whether the plant is close to the source of the raw material, whether this material is a by-product otherwise of little or no value, whether the supply is constant and likely to be of long continuance, whether power is costly, and whether the plant is subsidiary to another or demands much capital as an end in itself. Such considerations might show that alcohol produced at 50 cents in economically of better value than that at 6 cents. The demarking line of cost at which alcohol can compete with gasoline or petrol is sufficiently high, however, to cover the variations named, in the light of what is stated by the Advisory Council of Australia, viz., that when petrol is up to 72 cents a gallon alcohol can enter the market at 60. It was also shown by the same authority that with a properly designed alcohol engine, if alcohol costs 60 cents a gallon the cost per horse-power for one hour was only 6 cents as compared with the 7 cents of petrol.

If peat, as reported by the Motor Union Fuels Committee, can yield 90 per cent. spirit at 6 cents per gallon, the enormous supplies in almost every province of the Dominion may be considered as a vast reserve for fuel alcohol. How far in Canada the long winter, the cost of getting rid of superfluous moisture, the cost of initial plant and other points would nullify this favorable estimate is a question of great interest. It might well be a better raw material than sawdust, which represents decided difficulties. A sawdust plant of the capacity of 4,000 gallons a day would require to be fed with 200 dry tons and it does not seem possible that the supply of sawdust localized at any mills in Canada would approach that figure. Whether this process of treating sawdust at high temperature by sulphuric acid and converting the resultant cellulose into dextrose for fermentation would be a commercial success in plants of small capacity is uncertain.

Two sources are yet to be considered, coke-oven gases and sulphite waste liquor. In both cases these waste or partly waste products are utilized and the supply, though not very copious, is continuous; in both, also, the alcohol plant would be subsidiary and therefore close to the source of power and the raw material.

The coke oven process for the production of alcohol has not yet been carried quite far enough to enable us to estimate the future of this industry. The alcohol is here derived from the ethylene, which is a by-product of debenzolized coke-oven gases and is now being produced on a commercial scale at the Skinningrove Iron and Steel Works, in Yorkshire, England. In these works, 5,800 tons of coal are carbonized weekly, yielding an average of 1.6 gallons of alcohol per ton of coal. The utilization of the heat from the coke-oven plant is carried to the limit and there are several other derivatives from the debenzolized gases besides the alcohol. The cost of production is estimated at 50 cents per gallon.

Probably the most practicable source of alcohol in Canada at the present time lies in the waste sulphite liquor from the pulp and paper mills. This question is treated in detail in Bulletin No. 66 of the Forestry Branch of the Department of the Interior, published in 1919. The estimate there given of the probable yield from Canadian mills is 3,200,000 gallons a year, which would use up 20 per cent. of the solid bulk of the waste liquor, leaving the balance for other by-products. At the Cardiff Conference of the British Association, in 1920, the estimate was 5,000,000 gallons of 95 per cent. alcohol producible at 32 cents a gallon. The alcohol thus produced contains about 3 per cent. of methyl alcohol. Such a contribution, though a mere drop in the well of the world's oil production, would be a considerable aid in meeting Canada's account for imports of gasoline and mineral ores, which totals about $10,000,000 annually.

The use of alcohol as a motor fuel has at present, at least, one disadvantage, especially with the present type of automobile engine. This lies in the difficulty of starting from cold, owing to the stability at normal temperature of alcohol, as compared with petrol. Alcohol is to this extent more effective in engines of low piston speed and long stroke. The United States Department of Agriculture, in 1906, stated, as the result of experiment, that any

engine on the American market operating with petrol or kerosene could be run with alcohol fuel without structural change, but that owing to starting difficulties some alterations in the types of engine were desirable.

On the other hand there are several advantages in the use of alcohol. The compression in the cylinder is safe up to 200 lbs. per sq. inch, while with petrol there is a risk of pre-ignition at any pressure above 80 lbs. With alcohol there is less danger in storage, less offensiveness in the exhaust, and no tendency for the interior of the engine to become sooty or unduly corroded.

There seems to be a consensus of opinion that "if, as time goes on, kerosene and its distillates become scarcer and dearer by reason of exhaustion of natural deposits the alcohol engine will become a stronger and stronger competitor." During a period of transition a mixture of alcohol with other liquid fuels is probable, e.g., 50 per cent. of coal tar benzene mixed with the alcohol can be used in existing types of engines, but has the drawback of a less efficiency of the alcohol than when the pure spirit is used. Another mixture of about 60 per cent. alcohol, 39 per cent. ether, ½ per cent. arsenious acid and 1 per cent. ammonia gas has been reported by the Royal Automobile Club as equal in every respect to petrol.

Engineering Institute of Canada Holds Annual Meeting in Toronto

WITH a registration close on eight hundred, of which over three hundred were from outside points, the Engineering Institute of Canada held its first annual meeting outside of Montreal, February 1st to 3rd, in Toronto.

J. M. R. Fairbairn, Chief Engineer, Canadian Pacific Railway, was elected President for the year 1921, with H. G. Acres of Toronto, and Walter J. Francis of Montreal, as Vice-Presidents.

The welcome of the Ontario Government was extended by Hon. Harry Mills, Minister of Mines, on behalf of Premier Drury, who was unable to be present. Mr. Mills assured the Engineers of the appreciation by the people of the Province of the services rendered by the profession in many ways, and said the question of professional legislation would be considered in a very sympathetic way.

One of the most important discussions was that upon legislation. Members from provinces which had obtained legislation gave their experiences and offered suggestions in connection with the present movement for legislation in Ontario. Another subject which was discussed at some length was the need for revision in the grades of membership.

At the luncheon on Tuesday invitations for the 1922 meeting were received from Winnipeg and Vancouver and were referred to council.

A communication from the Canadian Pulp and Paper Association, asking concurrence in a solution in regard to the National Research Council, was received and it was decided to leave action to the council.

The address of the retiring President, Mr. R. A. Ross, dealt with the evolution of the profession, and referred to the number of different types of engineers, whose interests are involved in the maintenance of the Institute.

One of the features of the General Professional meeting which followed the business sessions, was that for the first time sectional meetings were held simultaneously. Five sections met, namely:—Electrical, Structural, Chemical, Mechanical and Municipal.

All were well attended. The last had such a large attendance that it had to get larger quarters.

Chemical Section.

The Chemical Section had an attendance of about fifty. T. L. Crossley was Chairman, and R. I. Wynne-Roberts, Secretary. J. R. Donald, B.A., B.Sc., Chemical Engineer of the Canadian Packing Company, read a paper on "Chemical Engineering in the Packing House." The following took part in the discussion:—

Mr. Thorold, who further described the Bannon Separator, explaining the difficulty in connection with "Floaters," which formed an intermediate layer between the water and the oil. These consist of particles containing so much oil that they were rendered lighter than water, but did not rise through the oil owing to their content of scraps. Mr. L. T. Acton of the William Davies Company, who also spoke of the difficulties in the separation of fat from water, and discussed some points in connection with pharmaceutical products. Mr. Donald replying to questions by the chairman, referred to the developments along pharmaceutical lines.

Mr. Lucius E. Allen, Consulting Chemist of Belleville, Ont., then read a paper on "Hydrated Lime as an Engineering Material." In connection with this paper, the meeting was favored with a number of slides, shown by Major L. H. Hart of the National Lime Association, Washington, D.C., illustrating the manufacture and uses of hydrated lime. Major Hart also made remarks with a special reference to the question of plasticity in the use of hydrated lime, showing in several slides a clean-cut effect, attributed to hydrated lime in adequate porportions in concrete aggregates. In addition several slides were shown with reference to manner of testing aggregates for plasticity.

Professor J. Watson Bain, President of the Canadian Institute of Chemistry was present, and on being introduced by the chairman, referred to the question of analysis of lime, objecting to the custom which now prevails of reporting all the calcium in an analysis as calcium oxide, though some of it might be present in the form of silicates, or other compounds, especially unburned carbonates. Professor E. G. R. Ardagh, discussed the difficulties in connection with the slaking of high magnesia lime and its uses.

Major Hart in reply said that the question of slaking was unfortunately one that had been left very much in the hands of ignorant labor, and definite scientific observations were lacking. In reply to Professor Ardagh, he said that magnesia limes were more plastic, and made somewhat stronger mortar.

C. P. R. President Makes Address.

At the Banquet in the King Edward Hotel, Wednesday evening, the brilliant list of guests included the Lieu-

tenant-Governor, the Hon. Lionel Clarke; the Minister of Public Highways for Ontario, the Hon. F. C. Biggs; E. W. Beatty, President of the C.P.R.; Dr. Dexter S. Kimball, Dean of the School of Engineering, Cornell University; Sir Robert Falconer, President of Toronto University, and a number of other well known public men.

President Fairbairn acted as toastmaster. After the toast to "the King," Lt.-Col. Lamb proposed the Lieutenant-Governor. In reply Mr. Clarke referred to the enormous national wealth of Ontario, and the services rendered by the Engineering Profession in its development. He referred also to the important Imperial service of Canadian engineers in the war.

In proposing the toast to Mr. E. W. Beatty, who was the guest of honour, Mr. Fairbairn spoke of railways as being in two stages. First that in which the engineer is most important, and secondly that in which administrative ability is required in order to keep the railways in efficient operation, and in which the engineer becomes second in importance to the General Executive Organization. He referred to the President of a Railway, as one who acted as a representative of both the owners and the operators.

In replying to the toast, Mr. Beatty referred to several of the outstanding enterprises in which the Engineers' Profession had played an important part in connection with the development of the C.P.R., mentioning the irrigation scheme in the West, the tunnelling of Mount MacDonald, and the Lethbridge Viaduct. Mr. Beatty also said that the engineer of the future would have much responsibility in connection with the elimination of "slumdom."

Col. J. S. Dennis then proposed the toast to the Department of Public Highways, which was responded to by Mr. W. S. McLean, Deputy Minister, both these gentlemen emphasized the fact that highways were a very necessary adjunct to the success of the railways.

Mr. A. Munro Grier, K.C., and Brig.-Gen. C. H. Mitchell, Dean of the Faculty of Applied Science, University of Toronto, made an amusing exchange in reversing their positions with reference to the toast to the Engineering Profession, so that Gen. Mitchell proposed a toast to his own profession, and Mr. Grier replied. General Mitchell spoke of the similarity in general properties of the engineer and the diamond, saying that there were about sixty-four different kinds of engineers, and all of them were diamonds. In reply Mr. Grier, who is President of the Canadian Niagara Power Company, said that when he was in Niagara, he could pose as a lawyer to avoid answering difficult technical questions, and when in Toronto he posed as an electrician to avoid difficult legal questions. His address was not only very humorous, but was also delivered in a most finished oratorical style.

Engineers are "Broadening Out."

Mr. R. A. Ross, retiring President of the Institute, spoke in a humorous vein of the various new kinds of engineer now coming to the fore, and again spoke, as in his valedictory, of the new phase in the activities of the Institute involved in an appreciation of the functions of the different kinds of scientific men. He proposed a toast to Sister Societies, which was replied to by Dr. Kimball of Cornell, who represented the American Society of Mechanical Engineers. He referred to the rapidly increasing number of engineers who are holding positions in the executives of great industries. He also made a very strong plea for the engineer to study problems in Human Relations.

It might be said that the general trend of the addresses delivered at this banquet indicated an appreciation of broadening conditions in the whole engineering profession.

At the General meetings Thursday, moving pictures of the Spanish River Pulp and Paper Company, and of the Riordon Company, showed the pulp and paper industry from the forest to the newspaper, to accompany a paper by T. L. Crossley. This was followed by a talk on the construction methods of Queenston, Chippawa power development of the Hydro Electric Commission, by A. C. D. Blanchard, who also showed moving pictures, in some cases taken from an airplane.

Illustrated papers on the Toronto Harbor Development by Mr. E. L. Cousins, and the Toronto Union Station by W. J. Armstrong were read in the afternoon session.

The Dance at Hart House, under the auspices of the Engineering Society of Toronto University, brought to a close one of the best attended, most enthusiastic meetings of professional men ever held in Canada.

Chemical Society News

MONTREAL SECTION, SOCIETY OF CHEMICAL INDUSTRY.

"The Packing House Industry" was the subject of a symposium given at the February meeting of the Montreal Section, Society of Chemical Industry, held Friday evening, February 18th, at Queen's Hotel. The meeting proved one of the best held by the Section, the subject being extremely well handled. There were about sixty members present. Unfortunately, one of the speakers, Dr. Robert Barnes, Chief Inspector, Meat and Canned Foods Act, Ottawa, who was to have given an address on "How Your Food is Protected," was, at the last moment, detained in Ottawa, and his assistant, Dr. Lowrey, who was to have replaced him, was suddenly taken ill on the day of the meeting, so that the meeting was deprived of one of its best papers.

After the usual routine business the symposium opened with a twenty-minute paper by Mr. J. R. Donald, late chemical engineer and chemist, Canadian Packing Co., Ltd., Toronto, covering the general aspects of the packing house industry, illustrating his remarks by two charts showing the general flow of products through a packing house. As Dr. Barnes was unable to be present Mr. Donald called attention to the very heavy losses involved in handling live stock from disease which is not discovered until after the animal has been killed. The Government, Mr. Donald explained, have a staff of inspectors in each plant who examine all animals killed and condemn or pass them for food. Owing to the large percentage of hogs and cattle suffering from disease, a very large and unnecessary wastage takes place.

In discussing the general features of the industry, Mr. Donald said in part:

"Before beginning our discussion of the manufacturing end of the packing house industry I would like to draw your attention to a few of the economic factors relating to this industry.

"In the first place the packing house industry is so closely related to our agricultural development that the packing house industry may be called an agricultural industry. This being the case it will be readily appreciated that the packing industry is one of the basic industries of the country and particularly suitable to the country. The raw material is found in this country and there is a good export market for the products.

Under normal conditions Canadian products are able to compete with the products of other countries successfully.

"In 1919 there were a total of 82 packing plants in Canada, these being scattered from the Atlantic to the Pacific coast with the greatest development in the Toronto district. These plants represented an invested capital of 93 million dollars. Their annual salary and wage bill was approximately 15 million dollars. The cost value of the raw materials was 175 million dollars, and their sales value 234 million dollars. The weights of the meat products produced were 742 million pounds.

"In this same period the various packing houses handled the following live-stock:—Cattle and calves, 945,000; sheep and lambs, 610,000; swine, 2,332,000.

"During the same period we exported meat products as follows: Beef, 112,000,000 pounds; bacon, 245,000,000 pounds; pork, 6,750,000 pounds; mutton, 5,000,000 pounds. We also exported $17,500,000 worth of hides.

"These figures which have been supplied by the Industrial and Development Council of Canadian Meat Packers give some idea of the size of this very important industry.

"In addition to the marketing of straight meat products the packer, through the nature of his business, becomes interested in fertilizers, vegetable oils and numerous by-products. As a result we have in conjunction with the packing business a large development in fertilizer plants, oil refining plants, and margarine plants.

"In dealing with the manufacturing processes in a packing house it must be borne in mind that the average packing house bears little resemblance to the old fashioned butcher establishment still in existance. The modern packing house is a manufacturing establishment turning out meat products. Its main difference from any other manufacturing establishment being that the raw product comes in on the hoof. Once, however, the killing operations are completed, the manufacturing conditions are similar to those existing in a number of other manufacturing industries.

"The successful superintendent of a modern packing house is usually a trained engineer keeping a close watch on costs and having the various processes under close control.

"As soon as the live stock is killed a division is at once made into edible and inedible products. This division is based on the suitability of various products for human consumption and the freedom of the animals of disease. The products which are suitable for human consumption proceed in one direction, the products that are unfit for such a purpose, or in other words, inedible proceed to a different part of the establishment. Moreover, diseased animals are subject to an inspection by government inspectors, and diseased parts or in some cases the whole carcass finds its way to the inedible department instead of to the edible department as would be its normal course. Regulations governing this division of material into edible and inedible are made by government authorities in Ottawa."

Mr. R. W. Rowat, Chief Chemist, Canadian Packing Co., Ltd., Toronto, closed the symposium by remarks on "Chemistry in the Packing House" calling attention to the necessity for close chemical control not only of by-products but of such processes as curing, smoking, cooking of meats, etc.

One of the most important features of the evening was the paper contributed by Mr. H. D. Tefft, Superintendent of the Harris Abattoir Co., Ltd., Toronto, on "Vegetable Oils", which paper will appear in full in our next issue.

TORONTO SECTION, SOCIETY OF CHEMICAL INDUSTRY.

Professor J. T. Burt-Gerrans, who was to have addressed the members of the Toronto Section, Society of Chemical Industry on "Storage Batteries" was unable to be present at the February meeting on account of illness. He was taken ill about a month ago, and following an operation seemed to progress favorably, so that he was expected to address the Section, but unfortunately he suffered a relapse, from which his many friends will wish for him a rapid recovery.

The meeting was held at Hart House, University of Toronto, Friday evening, February 26th, and in order that the members should not be deprived of hearing any paper, Mr. Rothwell, Secretary of the Toronto Section, "got busy" and succeeded in securing the good services of Mr. H. D. Tefft, Superintendent Harris Abattoir Co., Ltd., and Mr. R. W. Rowat, Chief Chemist Canadian Packing Co., Ltd., who repeated the addresses they gave this month to the Montreal Section, and in addition, Mr. W. Harris of the W. Harris & Co. gave an excellent account of the processes as carried on in their modern glue factory.

Mr. M. L. Davies in calling the meeting to order, referred to the inability of Professor Burt-Gerrans to attend and expressed the wishes of the Section that he would have a happy recovery from his illness. Mr. Davies announced that the plans of the executive for the entertainment of the overseas members next June were progressing favorably. He then called on Mr. Tefft, who presented his paper on "Edible Oils" which proved an exceedingly valuable contribution to the subject, and which will be published in full in our next issue.

Mr. Rowat followed with a description of the processes of the packing house. His references to the dressed meat production were especially interesting, pointing out the part played by the chemist in controlling by-products. Dressed meats were almost constantly shrinking in weight during the processes, and consequently required careful watching. The temperature of the smoke-house was an important factor as there was danger of losing considerable fat from the meat through too high a temperature.

The remarks of Mr. Harris on the "Operations in a Glue Factory" were followed with the closest attention. He referred to the two divisions of glues, inorganic or mineral and organic or vegetable and animal. An example of the first class was silicate of soda, while vegetable glues were obtained from starches, gums, seaweed and Irish Moss. Dextrine was made from starch and was a convenient form of glue. A well-known form of gum glue was Gum Arabic. Animal glues were divided into glues from hides and glues from bones. The glue factory used the waste pieces of the hide discarded by the tanner. These must then be washed thoroughly and the subsequent leaching process takes about forty days. Bone glues were only recently made in Canada, being a product forced by war production. Bones discarded from butcher shops and bones gathered by junk dealers were treated with hydrochloric acid in a process taking from thirty to sixty days. Mr. Harris briefly outlined the processes his company were operating and it is hoped that at an early date a complete account of these will appear in this journal.

Splendid discussions followed each address, and Mr. Davies pointed out that the Toronto Section had won a reputation for having better discussions, perhaps, than any other section.

A vote of thanks to the speakers, moved by Dr. Van der Linde, seconded by Professor G. A. Evans was unaminously carried.

JOINT MEETING OF OTTAWA SECTION, SOCIETY OF CHEMICAL INDUSTRY AND ENGINEERING INSTITUTE OF CANADA HELD.

A joint meeting of the Ottawa Section, Society of Chemical Industry and the Ottawa Branch of the Engineering Institute was held, Thursday evening, February 10th. Lt.-Commander C. P. Edwards, O.B.C. and Edgar Stansfield, M.Sc. were joint chairmen.

The routine business of both societies was dispensed with for the occasion, and Commander Edwards in a few introductory remarks expressed the appreciation of the Engineering Institute at the opportunity of meeting the chemists to listen to the dis-

cussion of so interesting a topic, as cements and supercements. He pointed out that as two speakers were to address the meeting, one an engineer and the other a chemist, that he as Chairman of the Ottawa Branch of the Engineering Institute would introduce to the audience Mr. E. Vien, who while Chief Chemist of the Public Works Testing Laboratory was also a member of the Engineering Institute and that Captain Dawson would rather be presented as a chemist by Mr. Stansfield the Chairman of the Local Section of the Society of Chemical Industry.

Mr. Vien on being introduced pointed out that he had persuaded Captain Dawson to discuss the subject in detail at this meeting and that as a consequence he (Mr. Vien) would not present a formal paper on the subject but would take part in the discussion following the presentation of Captain Dawson's paper.

Captain E. M. Dawson, M.C.E., was then introduced by Mr. Stansfield and proceeded at once with a review of the cement industry including the more recent work on supercements. The paper was well illustrated throughout by means of excellent slides showing microphotographs of different mixes and types of cement. The speaker divided his subject into three parts. He first traced the processes of manufacture of portland cement, and then outlined in some detail the methods of testing raw materials and products and finally he reviewed the improved methods of making cement due to the introduction of what he termed cata-coll, a substance which is characteristic of supercements. He claimed that the supercement was superior in every way to portland cement in that it is waterproof and more durable owing to the fact that a cata-coll promotes more complete hydration.

After Captain Dawson's address an animated discussion took place which was lead by Mr. Vien and developed by Messrs. Coutlee, Maclachlan, Anderson, Mr. Durley, G. A. Mountain and Dr. A. E. MacIntyre. The discussion dealt principally with the nature and composition of aggregates used in the manufacture of supercements. 65 in all were present at the meeting

FLOUR MILL VISITED BY MANITOBA CHEMICAL SOCIETY.

A record attendance turned out for the February meeting of the Manitoba Chemical Society, which was held in the laboratory of the Western Canada Flour Mills Co., at St. Boniface, Winnipeg. Members assembled there early in the evening, and were shown through the plant by Mr. Klinck, the second miller. Starting with the wheat as delivered from the elevator, its course was followed through the cleaning and tempering processes to the grinding floor, where its gradual reduction to flour, bran and shorts takes place. It was shown that after passing through each set of rolls, the ground products were separated by means of large rotating sifters, purifiers and reels, and that the grinding, sieving and purifying was continued until the endosperm had been freed as completely as possible from the germ and outer coats of the berry, and reduced to flour. The packing room and the warehouse were next visited, the members then returning to the laboratory, where everyone did full justice to the supper which was provided.

Later in the evening, Mr. L. D. Jackson, who is in charge of the laboratory, conducted the visitors through his department. He stated that eighteen to twenty car loads of wheat were required each day to keep the mill in operation, and that each parcel of grain received at the mill was carefully examined and binned in the elevator according to its milling value. In the event of any uncertainty as to the quality of a sample, a small amount was milled on the experimental mill, and a baking test made on the flour obtained. Samples of different types and varieties of wheat were shown.

Comparatively few chemical tests were required in routine mill control work, Mr. Jackson said, but if the milling process is to be at all intelligently carried out, and the various products kept uniform, determinations of the ash and moisture in the flour, and of moisture and protein in the wheat, must be made every few hours.

In the larger bake room, Mr. Jackson gave a short and informal talk on flour milling, supplementing the information which members had gained while visiting the plant. A complete set of samples taken from the mill had been arranged on the table and were examined with much interest. The experimental baking method was briefly described and test loaves made from the various grades of flour were exhibited, together with others which had been baked to show the characteristics of certain kinds of wheat.

Before the meeting closed, Professor Parker proposed a hearty vote of thanks to the Western Canada Flour Mills Co. for its hospitality and to Mr. Jackson for arranging so interesting and enjoyable an evening. This was carried unanimously.

A. W. ALCOCK,
Secretary Manitoba Chemical Society.

APPLICATION OF THEORY TO PRACTICE.

An address was given by Harold J. Roast, Secretary, Canadian Institute of Chemistry, before the Industrial Chemical Club, University of Toronto, Jan. 28th last, entitled "Methods that Make for Success in the Application of College Theory to Works Practice." The address dealt in a practical manner with the difficulties encountered upon entering the commercial world, and suggested very reasonable methods for avoiding them.

That the subject matter met the needs of the audience was evidenced by the enthusiastic reception that was given the lecturer and by the decision of the Club to have a permanent record made for the general benefit.

SHAWINIGAN FALLS SECTION.

The January meeting of the Shawinigan Falls Section, Society of Chemical Industry, was held on January 17th. Mr. W. G. Dauncey, Metallurgist of the Shawinigan Foundries, gave a paper entitled: "Iron from the Ore to the Finished Product." It consisted of a very interesting account of modern blast furnace and cupola practice, illustrated by lantern slides. Mr. Dauncey pointed out the superiority of malleable iron over steel for some purposes.

The February meeting was scheduled for the 15th. A paper by Mr. Elwood Wilson, of the Laurentide Company, entitled "The Place of Forestry in the St. Maurice Valley," was to have been given, but, unfortunately, this meeting has had to be postponed on account of the illness of the speaker.

ELECTRO-CHEMICAL DEVELOPMENT AT SHAWINIGAN DESCRIBED.

The development of the electro-chemical industries at Shawinigan Falls, Quebec, and of the great electrical power projects along the St. Maurice River, was excellently portrayed by Mr. H. W. Matheson, Vice-President of the Canadian Electro Products Company, before the Royal Canadian Institute, Toronto, Saturday evening, Feb. 19th. The speaker referred particularly to power developments at Shawinigan Falls, Grand Mere, and White Rapids, these making a total production of

400,000 h.p., and this could be enlarged by another 250,000 h.p. The dam erected by the Shawinigan Power Co. at the headwaters of the St. Maurice River to regulate the flow of water, held in check more water than the great dam at Assouan, Egypt, as the lake created above the dam by the erection of the latter, was 365 square miles in area. At Shawinigan Falls, 130,000 h.p. was used by the industries there.

A good part of Mr. Matheson's interesting address was devoted to the history of the production of magnesium in Canada. Prior to the war, it had never been produced outside of Germany, and the Canadian process was produced by Mr. Williams, a Toronto man.

In the latter part of the war, magnesium was used in alloys; magnalium, one of the alloys, is a material as strong as steel and very light and was therefore used in the metal parts of air-planes and dirigibles. It is expected that this war development will have a peace-time application to the construction of automobiles, being used in place of steel and other heavy metals. The speaker made the interesting announcement that the Italian Government had been conducting a number of experiments in connection with the use of this metal in engine pistons and the result had been that twenty per cent. more power had been obtained.

The other chemical industries at Shawinigan were described by Mr. Matheson, special reference being made to acetone and acetic acid. The address was followed with the closest attention by those present.

DR. RUTTAN APPOINTED CHAIRMAN OF RESEARCH COUNCIL

By an Order-in-Council, dated February 23, 1921, Dr. R.F. Ruttan, Director of the Department of Chemistry, McGill University, Montreal, has been appointed Administrative Chairman of the Honorary Advisory Council for Scientific and Industrial Research, Canada.

Dr. Ruttan was requested to take the chairmanship permanently when Dr. McCallum resigned therefrom last November, but, as Dr. Ruttan has no intention of severing his connection with McGill, he accepted the position until the pending legislation regarding the National Research Institute is accomplished. This legislation includes a partial reorganization of the personnel and powers of the Advisory Council. The post of Administrative Chairman, is entirely an honorary one.

PERSONALS

E. T. Sterne has recently returned from London, England' to become associated with G. F. Sterne and Sons, Manufacturers of asbestos cements, plastic firebrick, high temperature cements at Brantford, Ontario. Mr. Sterne was with the Imperial Munitions Board at their plant at Trenton, Ontario, during its period of operation, and later went to England as a representative of Shawinigan Electro Products, Ltd. He will also represent the English firm of Messrs. A. Boake-Roberts & Co., Ltd., London, England.

Mr. J. Richardson Donald who has been associated with the Canadian Packing Co., Ltd., Toronto, during the last two years as chemical engineer and chief chemist, has severed his connection with this firm and has taken up consulting work with J. T. Donald & Co., Ltd. of Montreal.

Colonel W. R. Lang, who has resigned his position as head of the Chemistry Department, University of Toronto, has been appointed Director of the new Department of Military Studies of the University. The organization and development of the new department will be the special care of Colonel Lang.

OVERSEAS AND FOREIGN INDUSTRIAL NEWS

Special Correspondence to Canadian Chemistry and Metallurgy. By our London Representative.

According to the British trade returns for the twelve months ended December 31st last, the imports of chemicals, drugs, dyes and colours into the United Kingdom during that period reached a total value of £35,315,326, as compared with £21,041,551 in 1919 and £13,335,795 in 1918. Exports of British-made chemicals, drugs, dyes and colors were worth £40,729,760, as against £27,015,153 in 1919 and £19,533,388, these figures being, in spite of inflated prices, ample evidence of the revival which has taken place up to recent months in the chemical industries of the Mother Country. Imports of chemical manufactures and products other than drugs, dyestuffs and fertilizers, and including acids, bleaching materials, calcium carbide, coal tar products, glycerine, sodium and potassium compounds, etc., reached a total value of £14,568,821 during the twelve months, and the value of imported drugs, medicines and medicinal preparations containing no dutiable ingredient was £5,124,296. Dyes and dyestuffs (except dye woods) and extracts for dyeing and tanning, imported from abroad reached a total value of £12,883,967, and painters' colors and materials imported amounted to £2,738,242 in value. Among the exports of chemical products from the United Kingdom in 1920, sulphate of ammonia accounted for £3,671,669; bleaching powder, £536,960; coal tar products, £2,865,636; sulphate of copper, £784,716; glycerine, £1,713,897; potassium compounds, £830,343; sodium compounds, £7,022,328; and in addition to the other coal tar products mentioned there were exported dyes and dyestuffs, including coal-tar dyes, together with extracts for dyeing and tanning, worth together £3,533,638, a considerable increase over the 1919 figure of £1,922,669 and that for 1918 amounting to £311,386; painters' colors and materials exported amounted to £5,635,508.

Pig Iron Production.

The following table gives the production of pig iron and steel in the United Kingdom for each month of 1919 and 1920:

	Pig Iron.		Steel Ingots and Castings.	
	1919. Tons.	1920. Tons.	1919. Tons.	1920. Tons.
January	661,000	665,000	718,000	754,000
February ...	626,000	645,000	734,000	798,000
March	691,000	699,000	758,000	840,000
April	647,000	671,000	668,000	794,000
May	671,000	739,000	755,000	846,000
June	658,000	726,000	631,000	845,000
July	641,000	750,600	618,000	789,000
August	521,000	752,400	474,000	709,200
September ..	581,000	741,000	718,000	884,700
October	445,000	533,200	433,000	544,300
November ...	624,000	403,200	695,000	505,100
December ...	632,000	675,300	692,000	745,400
Total	7,398,000	8,000,700	7,894,000	9,055,600

Loans to Dyestuff Firms.

The following Government grants and loans have been made by the British Government to United Kingdom dyestuff firms:—

To Scottish Dyes, Limited, a grant-in-aid of £75,000 for general purposes and £4,000 in aid of research, with a further research grant up to £1,000 per annum for three years;

To Messrs. J. B. & W. R. Wharp, Limited, a grant-in-aid of £10,000 and a loan of £17,000;

To the British Alizarine Co., Limited, a grant-in-aid of £107,000; and in addition

A grant of £100,000 for research has been made to the British Dyestuffs Corporation in pursuance of an undertaking given to British Dyes, Limited, at the time of its formation.

Licenses for Export.

In a circular issued to its members recently, the Chemical and Dyestuff Traders' Association of the United Kingdom states that information has been received from the Board of Trade that, as regards exports of chemicals and dyestuffs, licenses are being granted rather more freely at present owing to the falling-off in the home demand, and that the only items which are strictly prohibited are certain essential raw materials such as benzol, toluol, anthracine, etc., and a few special dyestuffs such as rhodamine, alizarine, synthetic indigo, etc.; naphthaline is being allowed, provided that applicants can show that supplies are obtainable. There are now no restrictions on the importation of chemicals other than explosives and opium, morphine or cocaine preparations. The circular adds that the question of appealing to the Board of Trade to lift the export restrictions altogether is under consideration.

The State of British Export Trade in Chemicals at the Beginning of 1921.

There is little activity at the moment in either the home or the export chemical markets, although in certain of the Latin American republics there are signs of a coming increase in trade.

Recently a number of investigations have been carried out in British India with a view to ascertaining the strength of that country in raw materials, the general impression being that it would prove profitable to establish a number of chemical factories to work the nitrate and soda deposits, and to set up factories for the manufacture of fertilizers. In Australia also there is an opinion that the chemical industry could be established on a firm basis by the expenditure of comparatively little capital, whilst in South Africa a certain amount of activity in chemical production has been apparent for some time. In all these markets, however, imports will be required in comparatively large quantities early next year, and the opinion is generally held that the period of trade depression is now at its lowest, and that things will improve during the spring. In connection with the overseas production of chemicals, the chief essential lacking is a supply of skilled and trained chemists. It would seem that there is no trouble anticipated in obtaining raw materials, whilst sufficient labor should be forthcoming. The difficulty is that few chemists with the necessary knowledge and experience seem to care to go, and there are fears that young German experts will become alive to the opportunities offered. It would be a great pity were this to prove the case, inasmuch as the openings for British chemists are many, and are such as are likely to prove lucrative.

Fine Chemicals.

The position of the British fine chemical industry is indeed critical, and the Association of British Chemical Manufacturers point out that the conditions which affect the dyestuffs industry, and which are fairly well known, apply equally to other branches of the trade with which the general public are not so familiar. In the fine chemical industry in particular the effect of German competition is being keenly felt. They point out that British fine chemical manufacturers realize the importance of attaining the highest possible standard of quality and have paid so much attention to this point that every one is agreed that their products are at least equal, if not superior, to those put out by other countries before the war. It is true that the cost of production has been somewhat high, but it must be remembered that these costs include the expense of a good deal of research work, and that with an increased output a reduction in production costs would be certain. It may be said that the chief factor affecting the British manufactures is the rate of exchange, by taking advantage of which German fine chemicals are being sold in the country at prices with which it is impossible for British manufacturers to compete without incurring serious loss. Well paid labor in Germany at the present time, according to the association, receives a sum which, in view of the prices of commodities in that country, ensures a high standard of living, and yet, when the rate of exchange is taken, works out at the equivalent of about 6d. per hour in English currency. English labor is paid three or four times this rate, and yet in spite of this severe handicap unrestricted imports appear to be the fetish of a large number of people, and the Government have not as yet coped with the anomalies of the situation. Quite a number of fine chemicals are now being imported into this country and sold at less than the cost of production here, or at prices which allow little or no margin of profit to the British manufacturer. For this reason, and to give only one example, the manufacture of phenacetin is being abandoned in this country, and amongst other German chemicals offered here at the cost of production or less are salicylic acid, aspirin, saccharin, beta naphthol, adalin, potassium bromide, formaldehyde, thymol, amidol, metol, rhodinol, acetanilide, and all kinds of perfumes.

New Offer of German Dyes.

An arrangement has been entered into between the Textile Alliance of the United Kingdom and the German Government, through which an entirely new offering of German dyes, said to be of standard pre-war quality, is being offered to the textile trade. In spite of this fact, it is interesting to note that the dye manufacturers on the Rhine are showing anxiety regarding the measures about to be taken by the British Government to safeguard the interests of the dye industries of the United Kingdom.

Japanese Color Makers Combine.

It is stated that the scheme of the Japanese color makers to effect a combination for the purpose of coordinate working, of all the sulphur black dyestuff manufacturers in their country, is making great headway, and that already 18 factories have arrived at an understanding, the total capitalization of these being about 4,000,000 yen.

Export of Japanese Fertilizers Increases.

The export of synthetic fertilizers from Japan to foreign markets is on the increase. The volume of exports last year, up to the end of August, reached 233,506 piculs, valued at 1,206,000 yen, as against 331,822 piculs, valued at 1,328,000 yen in 1917, 112,988 piculs worth 382,000 yen in 1918 and 41,294 piculs worth 31,300 yen in 1919. The conspicuous increase this year is attributed to the sudden growth of exports to Java, the Netherlands, East Indies, British India and other southern markets, in consequence

of the depreciation in the market price in Japan. The chemical industry in Japan seems to be gradually recovering from the recent economic depression. A sign of improvement is seen in caustic soda and soda ash, the accumulated stocks having considerably decreased and the market prices having recovered to a certain degree. A similar tendency is witnessed in paints, medicines, and other chemicals for industrial purposes. Some kinds are being exported to Russia, and the prices are gradually advancing on account of the decrease of the stock held over since last spring.

Electric Smelting of Galena in Tasmania—Making a Non-Poisonous Lead Pigment.

The manager of the Lead Sulphate Company's Works, Mr. J. Gitsham, claims to have solved the problem of producing metallic lead from the sulphide (galena) by means of an electric furnace.

The natural lead sulphide ore, after being finely powdered, is fed by means of three automatic feeders into the furnace. After being melted it is left to simmer in the furnace until the reduction has been completed by means of a flux, the secret of which it is said is the key of the whole process.

In the process it is possible to recover the silver as well as the lead. The cost is said to be about £3 per ton, against about £11 per ton when the ore is shipped to Australia. Cheap hydro-electric power is the main factor in this undertaking. The output of galena in Tasmania at present is about 10,000 tons per annum.

It is reported that after some years of research that the Lead Sulphate Company's works have produced a non-poisonous lead pigment.

It may be recalled that a British Departmental Committee, which in 1914 inquired into the dangers of lead poisoning, recommended that the importation, sale, or use of any paint material which contained more than 5 per cent. of its dry weight of a soluble lead compound should be prohibited. Recently samples of white lead manufactured at the Tasmanian works were analysed and found to contain from 2.04 to 2.62 per cent. of soluble lead. It is claimed, therefore, that the pigment can be exported as non-poisonous, and would be admitted into countries such as France and Belgium, where ordinary white lead is not allowed to be manufactured or sold.

German Chemical and Dye Industries.

According to a report on the German chemical and dye industries recently published officially in London, while the great chemical works in Western Germany are unfavorably situated for fuel supplies, they suffered much less from this disability during 1920 than in 1919, and it is also certain that they have adapted themselves with their usual skill to existing conditions, and in spite of all drawbacks are doing a very profitable business, even although they may not be running to the full extent of their capacity.

As in so many other branches of German industry, the difficulties of the present situation have intensified the desire for further amalgamation in the chemical industry. The companies producing tar, benzol and ammonia are united under the head "Chemische Werke Oberschlesien G.m.b.H.," with head office in Hindenburg.

This has now been followed by the proposed consolidation and extension of the well-known German Dye Works Combine. This will mean the continuation of the combine until 1999, which can only be dissolved by a four-fifths majority at a general meeting. It shows the great importance attached to nitrogen production that the proposal has at the same time been made for the combine to form a limited company with a capital of M.500,000,000, in order to take over the nitrogen production plants at Oppau and Merseburg.

There can be no doubt that the German Chemical Industry has survived the worst period after the war very well and has now consolidated. Conscious of its excellent organization and unique experience, it is now setting out to re-conquer its old markets. As far as the United Kingdom is concerned, the quantities give a fair indication of the power of production of the German factories. The latest figures available for dyes are as follows:—

Imports into United Kingdom

August, 1920, 21,758 cwt.

September, 1920, 23,557 cwt.

Nine months to 30th September, 1920, 117,299 cwt. (valued at £4,641,174).

December, 1920, 30,963. cwt

Total for year 1920, 196,772 cwt. (valued at £8,374,147).

As far as can be ascertained, these figures refer mostly to finished dyes, practically all of which were imported from Germany.

Import of Aniline and Napthalene Dyestuffs from Germany into United Kingdom.

1912, 261,049 cwt., valued at £1,316,084.

1913, 258,629 cwt., valued at £1.382,478.

Import of Alizarine and Anthracene Dyestuffs from Germany into Great Britain.

1912, 60,299 cwt., valued at £261,022.

1913, 60,315 cwt., valued at £271,119.

A considerable export of German dyes and artificial manures to the United States of America is also reported. In June 1920, artificial manures to the value of 600,000 dols. were exported from Germany to the United States of America. These were, however, potash salts.

Imports from All Countries

The value of the imports into the United Kingdom of chemicals, drugs, dyes and colors last year at the prices quoted in 1913 is estimated at £10,798,000, as compared with the total for 1913 amounting to £13,336,000, the figure revealing an actual decrease as against an apparent increase shown by the swollen 1920 total of £35,315,000. Exports, if quoted at the 1913 prices, would be £13,505,000, as compared with £19,533,000 in that year, the swollen figure for 1920 being £40,730,000.

The Chemical Industry in Switzerland.

The rapid development of the chemical industry in Switzerland has been attributed to many causes but the chief of these would seem to be the excellent educational facilities which the country has to offer. By turning out highly trained technical graduates the Universities of Basle, Berne, Zurich, Geneva, Lausanne and Neuchatel and the world-famed Polytechnicum of Zurich have been largely responsible for the industrial development of Switzerland.

In the development of the Aniline Dye industry at Basle the supply of electrical power has, however, not played a very important role. The Basle chemical works, the most important in the country, date as far back as 1856. Of their output over 90% is exported. Basle is chiefly renowned for its Aniline Dyes, its output being nearly 15% of the total world consumption of dyes. In 1918 the big Basle dye-works came to an agreement similar to that existing among German chemical firms, with the result that a "community of interests" was formed for a period of fifty years. The chemical "community of interests" of Basle is already a most important factor on the dye market and is likely to become more and more so. The substantial services it rendered to the British Government at a most critical moment by supplying indispensable chemicals, which it would have been extremely difficult to obtain otherwise, will not be forgotten by the comparatively small number of English people who are aware of them.

The remarkable annual increase of dye exports from Switzer-

land will be seen in the following table. Owing to the absence of data for the last quarter in 1920 the figure for that year only gives the export for the first nine months.

1913	Frs. 25,000,000.—
1914	" 27,000,000.—
1915	" 29,000,000.—
1916	" 52,000,000.—
1917	" 87,000,000.—
1918	" 91,000,000.—
1919	" 124,000,000.—
1920	110,000,000.—(9 months only)

It may be assumed that the export for the last quarter of 1920 will be approximately Frs. 35,000,000.—bringing the total for the year to about Frs. 145,000,000.—.

The development of the chemical industry shows therefore an uninterrupted annual increase. It is all the more remarkable because the German manufacturers have now started to export again. It was to be expected that with the return of Germany to the market a slump would set in which would temporarily affect Swiss manufacturers. This has indeed been the case but to a lesser degree than it seemed probable. Branches have been created by the Basle Dye interests in England, and in America and the already existing ones in France have been considerably enlarged. The slump in the dye market still continues but it is impossible that it will last long.

French Glass Industry.

It is stated in the French press that the crisis in the glass industry is particularly severe in respect of the manufacture of glass bottles. The crisis, which began in August last, has become considerably worse, and a number of glass works are likely to close down. It appears that the present situation is due to the scarcity of orders, which is in part the result of the difficulties experienced by manufacturers of scents owing to the increased duties on alcohol. Moreover, French glass manufacturers are meeting with severe competition from German and Czecho-Slovak firms.

Bottles made in Czecho-Slovakia are sold at Bordeaux 25 centimes cheaper than those manufactured in that town.

Alsatian Potash Trade.

During the first year of the French occupation of Alsace the potash trade increased by 141,000 tons, and in the first ten months of 1920 France alone consumed 370,000 tons and the United States purchased 220,000 tons. During the German regime in 1913, potash exports from Alsace for the year amounted to under 71,000 tons.

Salt in Australia.

A Committee of the Advisory Council of Science and Industry for South Australia has prepared a report on the question of salt production with a view to the manufacture of alkalies and the general extension of the industry in that State. There are approximately 14,000 acres of land leased for natural salt working in South Australia, the production in 1918 having been 88,519 tons, and during a period of ten years some 630,484 tons. The consumption of the entire Australian Commonwealth is about 90,000 tons per annum. South Australia is held to offer special inducements for the production of salt by evaporation from sea water, the total annual evaporation amounting in that State to 70 inches. Since the adoption of the Committee's report, the Standard Salt Company has established works at Edithburg.

Clashing Oil Interests.

There is room in the oil trade for all, said Sir Charles Greenway, chairman of the Anglo-Persian Oil Company, speaking at the launch of the tank steamer, "British Viscount" at the Neptune yard of Swan, Hunter, and Wigham Richardson. No one country and no one group of oil men, he said, could possibly hope satisfactorily to develop the resources and meet the demands of the whole world, and the more enterprise, brains, and capital, whether of American, British, French, Rumanian, or any other nationality, that could be devoted to the discovery, production, and marketing of the vast stores of oil which still awaited development in the hidden recesses of the earth, the better for mankind in general.

Referring to British policy in regard to the oilfields of Mesopotamia, Sir Charles Greenway said what was proposed or rather, demanded, by their competitors in America was that they should have taken away from them property acquired legitimately, and with the full knowledge and approval of the Governments concerned, before the war. They had heard that "Bolshevism" is spreading, but he did not think it had spread so far as to induce the American, or any other civilized Government, to approve of, or support, such an act of spoliation as this, even though camouflaged under the guise of the "open door."

Vanadium Production Suspended.

Mr. J. Leonard Replogle, president of the Vanadium Corporation of America, the leading producers of this rare mineral, authorises the statement that the American production of vanadium has been suspended. The reason is stated to be that the Company's Peruvian properties are producing enough vanadium to supply the world.

The International Nickel Company's $12,000,000 plant now being constructed at Huntington, W. Va., is expected to be ready for operation on November 1. The raw material will be inported from Canada.

Manganese Deposits in Western Australia.

It is reported in England that the recently investigated bodies of manganese ore in the Peak Hill Goldfield of Western Australia, have shown that there is available in a small area, an ore body of at least 1,250,000 tons. Assay averages were 43%. This is a new Empire source of an important mineral.

Osmiridium Mining

The Minister of Mines, Sir Elliott Lewis, in a statement to the British Parliament, said that the value of the output of osmiridium in Tasmania for 1920 was £67,987, an increase on the previous year of £23,093.

MINING AND METALLURGY IN BRITISH COLUMBIA.

(Special Correspondence to CANADIAN CHEMISTRY AND METALLURGY).

Perhaps the most interesting event of the month in mining circles is the bonding of the old Queen mine, near Salmo, to C. H. Cassill, of Spokane. The Queen was located towards the close of last century, and up to 1915 it produced slightly more than one and a half million dollars worth of gold. A cave in the main working winze caused a cessation of operations, and the property was idle until 1919, when A. W. McCune, the well-known Butte mine operator, took an option on the property, and drove a long tunnel. The work, however, did not develop prospects to satisfy Mr. McCune, at a time when gold mining was on the wane practically all over the world, and the option was relinquished. In the meantime, Mr. Cassill had bonded the Ore Hill group, which adjoins the Queen, and on it he developed what he believes to be an extension of the Queen vein. He, therefore, obtained an option on the Queen, and employed J. C. Haas, of Spokane, to make an examination, the result of which is the present bond and lease. On the bottom level of the Queen the vein is exposed over a distance of 800 feet, has a width varying from 8 to 33 feet, and is said to have averaged $9 per ton in gold, together with a small silver content. Mr. Cassill will amalgamate the two properties, which together contain 20 patented claims, and will organize a company to be known as the Queen-Ore Hill Mines, Ltd., with a capital of $250,-000. A 20-stamp mill and ample water rights on Wolf and Sheep creeks go with the property.

In the Court of Appeals, early in February, Justice Gregory reversed the decision of the lower Court, and re-established

the ownership of the Cassidy colliery, on Vancouver Island, to the Granby Consolidated Mining Smelting & Power Company. The Granby was given full title to the Dunlop property, and the Court found that the title to the Ganner property was vested in the Granby Company, but in the case of assessment for damages in respect to the coal rights, these are to be considered as "coal in nature". The outside price at this rate is stated to be $150 per acre, and, as only 200 acres are involved, the utmost that the Granby would have to settle is $30,000. When it is considered that the Granby has spent directly, in the purchase and equipment of the colliery, and indirectly in the making of the town, purchase of forest land for pit-props, and erection of a by-products coke oven at Anyox, some $4,500,000 in connection with this colliery, the $30,000 it may now be liable for seems small. The council for the Esquimalt & Nanaimo Railway gave notice of appeal to the Privy Council. The Granby Company has been granted permission to mine coal from the collieries pending the final decision.

To Explore Mineral Deposits Along E. & N. Railroad.

In reply to an inquiry in the Provincial Legislature, the Minister of Mines laid on the table the correspondence between his department and the president of the C.P.R. in connection with the mineral rights on the belt of land given to the Esquimalt & Nanaimo Railway, a subsidiary of the C.P.R. in consideration for construction of the line. This belt of land is supposed to be of considerable mineral value, and in recent years there has been good deal of dissatisfaction because the owners did not explore he land themselves and yet prevented others from doing so. The following from one of the letters of president Beatty of the C.P.R. is worth quoting: "We are advised by those competent to judge that in all probability there are valuable deposits of minerals in the land grant—the properties already being worked by the Consolidated Company (another subsidiary of the C.P.R.) such as the Sunloch mine, are evidence of this fact. In the circumstances, naturally, the company desire to acquire as much knowledge as possible of the mineral value of these lands before concluding the pending negotiations, and with this end in view it proposes, as early as possible, to do extensive exploratory work which will involve the expenditure of a large sum of money. We are arranging for the co-operation of the Consolidated Company in this connection. I can assure you that the company is one with the Government in its desire to see the mineral resources of the land grant developed, and the negotiations can be continued when we have the data desired."

Mining Notes.

Largely at the instigation of the Vancouver Board of Trade, the Provincial Government has appointed Alexander Henderson, K.C., of Vancouver, as commissioner to investigate the existing prices of coal in British Columbia, and has instructed him to complete the inquiry and make his report by March 26.

Despite the fact that very little custom ore is being shipped to the Consolidated Mining & Smelting Company's smelter, at Trail, the total ore shipment received at the smelter up to February 14, are some 8000 tons in excess of that received during the same period of last year. More ore is being shipped from the company's Rossland mines, No. 3 copper furnace was recently blown-in. The large output from the Sullivan mine is being maintained.

The Florence Silver Mines, Ltd., proposes to put a steamer and ore barges on Kootenay Lake this spring, to enable it to ship concentrate to the Great Northern Railway, and thence to the Bunker Hill & Sullivan smelter, at Kellog, Idaho, and in this way render itself independent of the C.P.R. Owing to the unsatisfactory freight-rates and the fact that it cannot obtain cash for its concentrate at Trail, the company has ceased to work the mine; lessees, however, are operating a small part of it.

The Noble Five Mine, in the Slocan, has been closed by order of the Dunsmuir interests, which vastly predominate. The mill at this property, which is one of the most up-to-date in the province, was completed at a cost of $250,000 last year.

Tim Griffin has stripped a 100-foot belt of ore at Hedley, the whole width of which is said to be of shipping grade. The opening has been made on the side of a mountain, and a good deal of trail building will have to be done to make the place accessible. A trial shipment is being prepared.

The net earnings of the Belmont-Surf Inlet mine, a subsidiary of the Tonopah-Belmont Development Company, for the three months ended September 30, amounted to $68,640. The main product of this mine is gold, which is saved together with silver and copper in the form of a concentrate that is shipped to the Tacoma smelter.

Frank Gorgan has developed an 8-foot lode that is said to average $35 per ton in gold at the Peerless group, near Nighthawk. Mr. Gorgan has done some 7,000 feet of development work.

BRITISH COLUMBIA INDUSTRIAL NOTES

At a meeting held in the city hall in February 15, the citizens of Nelson decided to combine together and start a match factory. The company is to be capitalized at $100,000, and will use a process invented and patented by J. D. Mantion, who will be superintendent of the factory. Mr. Mantion devised some of the processes now in use by the Diamond Match Company.

Deposit of Cellestite Discovered.

A deposit of cellestite has been discovered about three miles from Princeton. The owners of the property will attempt to develop the discovery commercially. An assay of the mineral gave a return of 75 per cent. strontium sulphate. This is believed to be the only reported occurrance of the mineral in Canada west of Ontario. It has been found at several points in Ontario and near Sydney, in Nova Scotia. It sprincipal use is for the manufacture of strontium nitrate, which, in turn, is used in the manufacture of red signal-lights and fireworks; strontium salts are used, too, in the refining of sugar.

New Pulp Mill for the Coast.

The Prince Rupert Pulp & Paper Company, a subsidiary of the Prince Rupert Lumber Company has been formed for the purpose of erecting a pulp and paper mill at Seal Cove. H. S. Taylor, chief engineer of the Mead Engineering Company, of Drayton, Ohio, made an examination of the site and of the timber limits owned by the new pulp and paper company in the interest of eastern capitalists who contemplate investing in the concern. At the start it is proposed to build a sulphite pulp factory at a cost of $1,000,000, and to add the making of paper at a later date. There is said to be a large supply of suitable wood, and the site embraces all the necessities that are required for a successful industry.

Will Re-Open Oil Refinery.

C. M. Rolston, local manager of the Imperial Oil Company, announced recently that his company had made arrangements for the delivery of 600,000 barrels of crude petroleum from Californian producers during the present year, and that as soon as the oil commences to come in the company's refinery, at Ioco, near Vancouver, will be re-started. Arrangements had been made for delivery of oil from Mexican sources to start next June, and it was not expected that the refinery would re-start operations before then. Now, of course, it will start up again much sooner.

The Imperial Oil Company has shipped an extra heavy oil-rig to Still River, whence it is to be hauled over the snow to Pounce Coupe, where drilling will be commenced as soon as weather conditions allow. The drill has a capacity for 4,000 feet. Oil seepages can be seen at a number of points along the banks of the Pounce Coupe river. The site chosen for the bore is said to be just on the Alberta side of the inter-provincial boundary-line.

"ROYAL DUTCH" ENTERS ALBERTA FIELD

Advice from Edmonton states that the Royal Dutch Shell Oil Company has filed claims on 15 townships on the Wapiti River, south of Grande Prairie, and has ordered 15 oil-rigs to be shipped from Pittsburg to the properties.

Next to the Standard, the Royal Dutch is probably the strongest oil company in the world. It owns wells in the East Indies, Egypt, Russia, Roumania, Venezuela, Mexico, and the United States; it has three refineries in the United States, and their combined output averages 47,000 barrels per day. It is supported by the Netherland's Government and also by the British Government. The British Government owes it a deep debt of gratitude, for in the early stages of the war H. W. A. Deterding, the head of the concern, dismantled his refinery in Holland, and, under a strong convoy, moved it across the North Sea and up the Thames to London, whence it was transported overland to Portishead, on the Bristol Channel, and re-erected. This was done in order to supply the British Government with benzol without the danger of transporting it across the submarine-infested areas of the North Sea. Of course, the motives were not entirely altruistic, but of the value of the company's aid to the Allies there can be no doubt. It is hardly necessary to emphasize the value to Canada of the entrance of so powerful a concern into the Canadian field.

BOOK REVIEWS

"THE CHEMISTRY OF PULP AND PAPER MAKING."

By Edwin Sutermeister, S.B.; John Wiley & Sons, Inc., New York. Chapman & Hall, Limited, London. 8 vo., 480 pp. Price $6.00 U.S.A.

Mr. Sutermeister as chief chemist of one of the largest Pulp and Paper Manufacturing concerns in America, has had exceptional opportunities to devise, investigate and adapt methods of analysis that bear especially on the manufacture of paper and the treatment of raw materials for paper, and this work, therefore, has a very practical application.

The subject matter includes a good description of the commercial chemical processes for the preparation of wood pulp with some account of other fibrous materials and their treatment. Cellulose, its properties, solvents, reactions and methods of determination, is treated in the opening chapter of thirty pages, followed by a chapter on fibrous raw materials, including twenty six excellent photomicrographs prepared by the Paper Section of the United States Bureau of Standards of uniform magnification, and well printed.

Chapter III. covers rags, esparto, straw, bamboo, and old papers.

Wood pulp processes are discussed in the following four chapters. The alkaline, soda and sulphate processes being covered in sixty-three pages.

It is noted in giving the composition of the sulphate cooking liquors, page 144, that only European authorities are quoted and that they vary greatly, for example, caustic soda from 45% to 80%, and sodium sulphide 11.25% to 30%.

We believe practice on this continent is more uniform and would have expected some figures from United States or Canadian Mills.

The treatment of the sulphite process is good and included matter not elsewhere compiled. The sectional drawing of stone tower is, however, not of the most recent design.

On page 224, the "Bleaching of wood pulp" is mentioned. For clarity this should be "ground wood pulp," in this instance.

Three chapters describe sizing, filling and coloring, especially with reference to the nature of materials used and tests of their purity. There are also good photomicrographs of various fillers at uniform magnification.

The chapter on coated papers will be welcomed by chemists seeking information on this class of paper, which is not readily available in general literature.

In the chapter on testing of pulps, the author appears to acquiesce in the practice of standardizing moisture tests, the practice that compels a referee to act by arbitrary rules rather than use his judgment. This practice is not scientific and it is regrettable that conditions in the industry have led to its adoption.

The remainder of the book covers special tests of paper for strength, fibre content, fillers and sizing materials used, and finishes with a chapter on printing and paper defects arising in use.

A number of useful tables is appended.

The work shows care in assembly of information, and has apparently been well proof read. T.L.C.

"Storage Batteries."

By C. J. Hawkes, the William Hood Dunwoody Industrial Institute, Minneapolis. Price, $1.00.

This book is designed for students undertaking technical courses on the subject. The practical is well tempered by fundamental theoretical considerations. Any one concerned with battery manufacture or the usual applications of storage batteries, will find the instructions given with regard to all situations likely to arise to be very complete. This book can be recommended with safety.

"Elementary Lessons in Mathematics of Electricity," by R. W. Kent, William Hood Dunwoody Industrial Institute, Minneapolis. Price, $1.00. A book for technical students taking practical courses in electricity.

"Heaton's Canadian Export Book."

Heaton's Agency, Toronto. Pp. 214. Price, $5.00.

Heaton's Agency is associated with the Trade Commissions of the Dominion Government in the production of this index of Canadian exporters and compilation of trade information.

The directory contains names, addresses and cable codes of over 2,500 firms in Canada who are exporting or in a position to fill export orders. Products exported are listed with details of amounts to each country. Reviews of various Canadian industries, including the chemical industries, are given. It is a very valuable effort, and the announcement is made that it will become an annual production of Heaton's Agency. No doubt firms, both in Canada and abroad, will recognize its merits, as it places in handy, reliable form more information regarding Canadian export matters than anything else we have seen.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

Reported to Canadian Chemical Journal by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Concentration of Ores.
H. R. Robbins, 208256, Feb. 1, 1921. Ores containing sulfides of Cu and Fe are concentrated by adding a non-alkaline salt to freely flowingpulp of ore, without an organic frothing agent, producing fine air bubbles in the pulp, collecting and separating the froth formed.

Production of Nitric Acid.
K. B. Quinan, 208370, Feb. 8, 1921. Gases containing oxides of N are repeatedly brought into contact with water or dilute HNO_3 by distributing the latter over permeable diaphragms through which the gases are caused to pass.

Production of Metal Oxides and Other Compounds of Zinc and Lead.
Jas. A. Singmaster, Frank G. Breyer and Earl H. Bunce, 208869, Feb. 22, 1921. ZnO or leaded ZnO is produced by advancing through the combustion zone a working charge containing Zn or Zn and Pb bearing mater-

ial and a reducing agent spread on an ignited layer of briquets while passing combustion supporting gas into the charge.

Process of Treating Cu-Bearing Alloys.
Wm. J. Marsh, 208410, Feb. 8, 1921. Cu-bearing alloys are treated with an aq. solution containing $CuCl_2$ in the presence of Cl to maintain the $CuCl_2$ content of the solution.

Silica Gels.
Walter A. Patrick, Can. 208770, Feb. 22, 1921. A porous gel stable at temps. up to 700° and having high adsorptive powers is produced by mixing, with vigorous stirring, a solution of an acid and sol silicate of such concentrations that the resulting mixture will set to a gel without removal of any of the excess acid and salt, then washing out the excess acid and salt and drying the resulting product.

Apparatus for the Electrical Precipitation of Suspended Particles from Gases.
Walter A. Schmidt, 208861, Feb. 22, 1921. The discharge electrodes of the precipitating apparatus consist of vertically extending rigid smooth bars or rods of metal.

Treatment of Zinc Solutions.
Elias F. Petersson, 208606, Feb. 15, 1921. Soluble silica is recovered from Zn solutions for electrolysis by treating the solutions with an excess, of an alkali earth carbonate at 90—100°.

Electroplating With Metals.
B. Bart, 208301, Feb. 8, 1921. An anode is prepared for electroplating by depositing metal upon a core composed of solid portions alternating with openings.

Heat Treatment of Wire or Sheet Metal.
Randal E. Talley, 208856, Feb. 22, 1921. Wire or sheet metal is heated by passing it through a tunnel closely adjacent to a strip of highly heated metal, the latter being heated by electrical or other means. Apparatus is also specified.

Ammonium Sulphate.
C. Bosch, 208833, Feb. 22, 1921. $CaSO_4$ is treated with $(NH_4)_2CO_3$ in the presence of water, the solution is filtered with a dipped hollow frame filter and the layers of carbonate are washed free from $(NH_4)_2SO_4$.

Apparatus for Concentrating Ore by Flotation.
G. Grondal, 208204, Feb. 1, 1921.

Process of Recovering Mercury.
H. W. Matheson, 208348, Feb. 8. 1921. Hg is recovered from sludge by separating the Hg from the other ingredients by washing, then heating to 100-500° to decompose Hg compounds and coalesce the free Hg particles, then dry grinding the remaining mass to separate metallic Hg, again heating to 100-500° and wet treating to remove non-mercuric matter.

Removing Water from Peat.
208415, Feb. 8, 1921.

Process and Apparatus for Concentrating Ore.
R. Luckenbach, 208212, Feb. 1, 1921. Ore pulp is passed through one or more screens composed of excelsior coated with oil or grease which may or may not be mixed with liquid rubber. The mineral values adhere to the screen and the gangue is rejected.

Mineral Selective Agent and Method of Using the Same.
R. Luckenbach, 208210, Feb. 1, 1921. Finely divided ore is mixed with water to form a pulp and the pulp is directed against a surface consisting of petroleum grease and rubber to which the mineral content will adhere and then separating the mineral from the material. A moving belt may be used as the surface to which the selective agent is applied.

Mineral Selective and Frothing Agent and Producing and Using Same.
R. Luckenbach, 208211, Feb. 1, 1921. Resinous substances may be used collectively or individually and or mixed with oleic acid or alkali or both as a frothing and selective agent. The agent is mixed with the pulo, the mixture treated and the froth removed.

Process for Producing Vanadiferous Pig Iron and Steel.
Arthur F. G. Cadenhead and Wm. M. Goodwin, 208623, Feb. 15, 1921. Vanadiferous iron ore is furnaced with a reducing agent and a suitable flux to produce pig Fe having a maximum proportion of Va therein.

Flotation Machines.
D. P. Hynes, 208135, Feb. 1, 1921. The apparatus comprises a tank divided into two chambers and laterally spaced foraminated rotary discs partially submerged in the pulp contained in one chamber and adapted when rotated to entrap air from above the surface of the pulp and carry it into the same where it is liberated as bubbles to form a froth and cause the froth to be discharged into the other chamber at a point below the upper edges of the discs.

Electrolytic Process for Cleaning Electrodes.
K. S. Guiterman, 208484, Feb. 15, 1921. Electrodes coated with deposits of metal such as Co are cleaned by utilizing the coated electrode as the anode of an electrolytic cell, containing an electrolyte sufficiently acidic to prevent the deposition of the metals dissolved from the electrode and passing a current through the cell.

Frothing and Mineral Selective Composition and Process of Making and Using Same.
R. Luckenbach, 208213, Feb. 1, 1921. The reaction product of permanganate of potash and a resin with or without NH_3 is used as a frothing and mineral selective agent.

Production of Metal Oxides.
Frank G. Breyer and Albert E. Hall and Geo. R. Waltz, 208868, Feb. 22, 1921. In the production of ZnO or leaded ZnO by the Wetherill process a relatively deep layer of bed fuel in the form of briquettes is placed on the furnace hearth and a working charge in the form of briquettes is spread on the ignited layer of bed fuel.

Bessemerizing Iron and Converter Therefor.
Richard S. McCaffery, 208524, Feb. 15, 1921. A bath of molten Fe is bessemerized without basic additions in a converter provided with an acid lining, except in the region contacting with the basic products which may be liberated during the operation of the process. Converter is also specified.

Ore Flotation Apparatus.
Jas. B. Brown, 208077, Feb. 1, 1921. The apparatus comprises a container divided into a feed chamber, a separating chamber provided with an overflow and a transfer conduit which adjacent its bottom communicates with each of the chambers for reception of material, and which has an outlet adapted to deliver material in sheet-like form onto the liquid level in the separating chamber and means for introducing a gas into the lower part of the transfer conduit.

Methods of Making Manganese Steel.
Wesley G. Nichols, 208831, Feb. 22, 1921. To a weighted quantity of blown metal having a temperature of 3000° F. is added a sufficient quantity of Mn steel alloy at a temperature of 2400° F. to produce a steel having a Mn content of 11-14% and of proper pouring temperature. The metal is then poured into molds.

Methods of Recovering Manganese Steel.
Wesley G. Nichols, 208832, Feb. 22, 1921. The charge of metal is heated by an initial application of heat not over 700° F., the temperature is increased in stages to bring the mass gradually to the m.p. of steel and finally to the point of high fluidity just previous to tapping.

Extraction of Copper and Nickel from Low-grade Ores.
W. Borchers and H. Pedersen, 207475, Jan. 11, 1921. Cu-Ni matte is roasted and leached with acidulated water. Cu is precipitated with H_2S and the precipitate is reduced to metallic Cu, the residual $NiSO_4$ solution is evaporated, the $NiSO_4$ roasted to form NiO which is then reduced to metallic form.

Production of Metallic Alloys.
J. P. Arend, 207281, Jan. 4, 1921. Alloys free from O are produced by treating the material with a reducing slag containing alkali manganese silicates during the melting operation.

Process for protecting Iron Alloyed With a High Percentage of Silicum, Manganese, Phosphorus or Like Ingredients.
Fritz Greiner, 207285, Jan. 4, 1921. Fe alloys are protected during smelting by coating the fragmentary or pulverized alloy with a fireproof envelope of calcareous material, the material may be briquetted.

Concentration of Nitric Acid.
Olaf Jensen, 207546, Jan. 11, 1921. HNO_3 to be concentrated is partially evaporated while maintaining the acid in motion and causing the separation of the precipitated solids and the vapors are passed into contact with concentrated H_2SO_4.

INDUSTRIAL ITEMS.

Canadian Hanson and Van Winkle Co., Ltd., Toronto, have recently completed a new gray iron foundry. They have installed complete sand blasting equipment.

Oak Tire and Rubber Co., Oakville, Ontario, has recently reorganized, increasing capital from $400,000 to $3,000,000. The plans call for extensive building operations.

The Beaver Co., of Thorold, Ont., have completed the reorganization of their plant near Hull, Que. They are making vulcanite roll roofings and asphalt shingles.

The capacity of the new sulphite plant of **Canadian International Paper Co., Ltd.**, Three Rivers, Que., is 60-70 tons per day.

The Elcoya Co. of Canada is entering into the manufacture of certain toilet preparations at Aylmer, Ont. They will make cold cream, rouge and face powders.

Machinery & Foundries, Ltd., has been incorporated to manufacture pumps, gray iron and brass castings. Plant is located at Brockville, Ontario.

It is reported that machinery is being installed in the new plant of **Fort William Paper Co.**, Fort William, Ontario.

Brittannia Wire Rope Co., Ltd., have opened the first wire rope factory in Western Canada, at Granville Island, Vancouver. This is a British concern having complete connections in this business.

With a capitalization of $2,000,000, the **Prairie Cold Storage Corporation, Limited**, has been registered under a Manitoba provincial charter. It is proposed to build a $450,000 cold storage plant in this city, and branch cold storage plants at Brandon, Verdun, Portage la Prairie, Dauphin and Port Arthur. Winnipeg people associated with British and United States capital are said to be behind the scheme.

The daily capacity of the copper refinery of the **Consolidated Mining and Smelting Company** has been increased to 50 tons. Both ingot and cake copper are being turned out, and wire bars will be a regular product when the copper rod mill, now nearing completion, begins operations. The rod mill has a daily capacity of 150 tons of wire rods, enough to take care of all the Canadian demands.

Plans of the **Abitibi Power and Paper Company**, Iroquois Falls, Ont., provide for not only the doubling of the present output of newsprint, but a large increase in the production of the other products of the company. The output of newsprint will be increased to 500 tons a day, and the production of sulphite and boards will be increased to between 200 and 240 tons per day. This will give the company a total production of 700 tons a day.

A cement plant to give employment to more than three hundred men is to be located at **Havelock, New Brunswick.**

The development of the prospective Pouce Coupe oil field, northwest of Peace River, is being engineered by the

Imperial Oil Company without delay; a heavy standard drilling rig, capable of going down 4,000 feet, is being shipped by rail to Spirit River, and will be freighted by teams to the oil field on the snow.

Fire, Jan. 7, damaged a portion of the plant of the Hooker Electro Chemical Co., Ltd., Buffalo Avenue, Niagara Falls, N.Y., with slight loss.

SHAWINIGAN POWER COMPANY HAVE SUCCESSFUL YEAR.

The annual general meeting of the shareholders of the Shawinigan Water & Power Company, Ltd., was held at the head office, Montreal, during the second week in February, and the annual report showed that the company had passed a most successful year, particularly from the standpoint of having accomplished considerable development work. The meeting was well attended, 6,587 shares being represented in person, while 97,080 shares were represented by proxy. The annual report pointed out that the year 1920 marked the completion of the twenty-third year of incorporation and the twentieth year of operations, work having commenced on the power development at Shawinigan Falls early in 1900. A summary of the salient points in the history of the company is then given at some length, following which the report states in part:

"The electrical capacity of the company's power stations has risen to about 150,000 horse-power, which, with the 70,000 horse-power now being taken under contract from the Laurentide Power Company, Ltd., makes a total of 220,000 electrical horse-power flowing into your company's distribution. In addition, the company has available hydraulic power, of approximately 60,000 horse-power.

"The growth of the company's business is shown by the following figures: The load on the power stations was in 1905, 20,000 h.p.; 1915, 50,000 h.p.; 1919, 100,000 h.p.; 1920, 220,000 h.p. This shows a growth in fifteen years at an average rate of about 14,000 horse-power per year, while the growth for the past five years has been ahout 20,000 horse-power per year.

As against this ratio there is under contract in the present year new business which will require the installation of 40,000 horse-power at Shawinigan Falls. These contracts when brought into operation will augment the company's gross revenue by more than a milion dollars per annum. All of this power will come on the company's system during 1921 and early in 1922. This has also involved the duplication of the company's lines to Thetford Mines and Quebec, which has been completed, and a second transmission line to Montreal, undertaken in the past summer season, will be completed during this year.

"The company had financed its requirements from time to time by means then available and under the conditions existing at the time. In 1918 a larger provision was made through the authorization of a bond issue which may aggregate $50,000,000 at any time outstanding, thus equipping your company for any financial operation which may be required in the future.

"The splendid financial basis upon which your company rests can be clearly shown by this strong asset position, there being about $34,000,000 of fixed assets against only about $13,000,000 of bonded indebtedness, including short-term notes. The company's various reserves amount to over $4,000,000, or approximately 20 per cent. of the entire outstanding common shares.

"The figures of output for 1920 of 1,140,759,076 kilowatt hours indicate the company's importance in the industry of the Province. This operating position is paralleled only in one or two other industrial centres in North America. Niagara Falls, producing electrical energy for many years, and the cities of New York and Chicago, operating steam units on a large scale, are the only comparable industrial centres from the standpoint of the production of electrical energy.

"As your directors have from time to time informed you, the production of electrical energy from hydraulic developments has proceeded on a large scale, and will in the future proceed in an ever-increasing degree. Hydro-electric plants are assuming much more importance in the industrial world than ever before, and your company stands in a pre-eminently satisfactory position."

LAURENTIDE POWER COMPANY.

The gross revenue of the Laurentide Power Company, whose power development plant is at Grand'Mere, Quebec, for the year 1920, amounted to $1,040,887, as compared with $847,845 for 1919. Net profits for 1920 were $866,792, an increase of about $100,000, from which bond interest was deducted, leaving $432,255 applicable to the company's share capitalization. Unexpected expenditures had to be made during the year by the payment of heavy exchange rates on the bond interest payable in New York.

Steady progress has been made in the extension of the power plant, and while this work has been somewhat delayed, it is expected that before July 1st of this year the two additional units will be in operation. This will bring the total capacity of the company's plant up to 165,000 horse-power. The power output of the Laurentide Company is controlled by the Shawinigan Water & Power Company. Mr. J. E. Aldred is president of both companies.

NEW ESSENCE FACTORY

Messrs. A. Boake-Roberts Co., Ltd., London, England, announce that they will shortly establish a Canadian manufacturing and distributing agency under the direction of E. T. Sterne of Brantford, Ontario. They produce fruit essences, synthetic perfumes, flavoring materials, essential oils, ester gums and varnish driers. Arrangements are being made to distribute English tartaric and citric acids, cream of tartar, etc.

NEW CANADIAN GLASS-BLOWING FACTORY.

Progress is being made in the matter of manufacturing glass chemical apparatus in Canada.

Canadian Laboratory Supplies, Ltd., Toronto, are manufacturing, for the first time in Canada, a number of standard articles used in all laboratories. Such articles as Fleming's combustion apparatus, condensers, Dewar's vacuum vessels, potash bulbs, various types of pipettes and gas analysis apparatus are now being produced by Canadian workmen. In addition to the regular items, they are making special equipment to blue print specifications, and have a repair department. This is interesting, as it marks a beginning towards a business which may just as well be developed in Canada as Germany, the United States or England.

Mr. G. E. Le Worthy, formerly of the University of Toronto, is superintendent in charge of manufacturing operations.

CATALOGUES AND REPORTS RECEIVED.

English Chemical Glassware.—This is the name given to a very excellent catalogue gotten out by Wood Bros. Glass Company, Ltd., Borough Flint Glass Works, Barnsley, England, and consists of 64 highly embossed pages, beautifully illustrated. Wood Bros. are one of the oldest English firms in the glassware business. Their first furnace was built in 1828. They first specialized in cut table glass, for which in 1851 they were awarded a medal at the Crystal Palace Exhibition. Later, they branched out into the making of medical glassware, in which field they won a world-wide reputation. In 1915 they began the making of chemical glassware, and have had phenomenal success in this branch. The catalogue opens with copies or reports made by the National Physical Laboratory, Teddington, England, on glassware produced by Wood Bros. Every form of apparatus is dealt with in the catalogue, and prices are given for each article, this being a feature too often not found in Canadian and American catalogues, although one might well wonder how in the world a company can call anything a catalogue which does not contain prices. The principal kinds of glassware described are: Absorption apparatus, beakers, bottles, condensation and distillation apparatus, filtration apparatus, flasks, funnels, gas analysis apparatus, tubes and rods, volumetric apparatus, and miscellaneous apparatus, including stoppers, stopcocks, etc. The George Taylor Hardware Company, Ltd., Cobalt, Ont., are listed as Canadian stockers of the Wood products.

T. E. O'Reilly, Limited, Toronto, have been appointed agents in Canada for all Darco Certified Food Colors. These colors are certified by the United States Department of Agriculture and conform to Canadian Government standards. They are produced by Darvin Chemical Company, Elizabeth, New Jersey, U.S.A.

MAY FORCE MANUFACTURE OF ASBESTOS

While about 85 per cent. of the world's asbestos supply is in Quebec province, the greater part of it is shipped to the United States in the raw state where it is put through various manufacturing processes, and as a result the province benefits little from the industry. To overcome this adverse condition there is a strong possibility that the Quebec Government may impose some form of an embargo against the shipping of all of the asbestos out of the province in the raw state, thus compelling its manufacture, to a certain state at least, in the province.

It must be remembered that the asbestos mines of Quebec are Crown lands, the mines not being sold outright but mineral rights only being granted, a situation akin to that of wood cut on Crown lands, which cannot be exported except as pulp and paper. Should the Quebec Government act along the lines indicated, a splendid new industry would be added to the province. For the 12 months ending June 30, 1920, the production of asbestos in Quebec was 174,421 tons, valued at $11,758,234.

CANADA 4th IN WORLD'S PRODUCTION OF RUBBER

At the banquet of the Annual Meeting of the Rubber Association of Canada held recently in Montreal, the president Mr. C. H. Carlisle referred to the rapid growth of the rubber industry in Canada. Canada was now, he stated, fourth among the rubber manufacturing nations of the world, her rubber business having grown from $4,600,000 in 1910 to over $56,000,000 in 1919.

Guests and members present totalled over 200, the speaker of the evening being the Hon. Hugh Guthrie, Minister of Militia and Defence. During the course of his address Hon. Mr. Guthrie declared that the financial position of Canada was better and sounder than that of any other of the thirty-eight nations gathered at Brussels last year to discuss world financial questions with the single exception of the United States. On the tariff question he emphasized strongly that the Government intended to maintain sufficient tariff to protect Canadian industries and assist in paying revenues. It was nothing but the maintenance of her tariff which had been responsible for the wonderful industrial growth and development of Canada in the last forty-two years.

At the business meeting of the Association the following officers were elected: C. H. Carlisle, president; W. A. Eden, vice-president, C. N. Candee, treasurer; directors, W. H. Miner, R. F. Foote and F. E. Partridge; manager and secretary, A. B. Hannay.

CANADA'S MINERAL PRODUCTION, 1920, MAKES RECORD FOR VALUE.

According to a preliminary report of the mineral production of Canada during the year 1920, prepared by Mr. John McLeish, Chief of the Division of Mineral Resources and Statistics, Ottawa, the total estimated value of the metal and mineral production in 1920 was $217,775,080, which is greater than the total value reached during any preceding year. Compared with the production in 1919, valued at $176,686,390, an increase of $41,088,690, or 23.3 per cent. is shown, while compared with 1918 the previous maximum year, the increase was $6,473,183, or 3 per cent.

The evidence toward the close of the year of economic depression, falling prices, restriction or complete cessation of operation at numerous points, tended to monopolize the public mind, and to divert attention from the fact that Canada's mining industry during 1920, has furnished an output, the value of which was greater than had been attained in any previous year.

Chemical, Oil and Metal Markets

The quotations below represent manufacturers' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

CHEMICALS.

The best thing that can be said for the general chemical market at the beginning of March is that enquiries from prospective purchasers are better, and that sales are somewhat improved—and when one has said that he has just about said all that can be said in favor of market conditions. Business has not picked up as well as was expected. There is no doubt but that several lines are selling below the cost of production, and this is not good for either the manufacturer or the buyer, though the latter may think it is. About the only chemicals showing any firmness at all are boric acid and zinc oxide. Boric acid is holding firm at 18½c per lb., while zinc oxide is unobtainable below 13c, and that is a good quotation on large amounts.

While declines are more noticeable in the fine and pharmaceutical chemicals, yet enquiries are better in these than in the heavy. Apparently the declining values have stimulated the trade to make enquiries, but, alas, these enquiries too often end there, and actual buying is about the same volume as in February.

Declines—Declines in prices have occurred during the past ten days in the following, the amount of the decline being given: Ammonium carbonate, .04c; carbon bisul-

phide, .02c; caustic potash, .06c; potassium permanganate, .05c; sodium benzoate, .10c; sodium bichromate, .04c; sodium cyanide, .02c; sodium nitrate, ½c; sodium prussiate, .03c; tartaric acid, .25c; citric acid, .10c; hexamethylenetetramine, .50c. And these do not constitute the whole story—salicylic acid, for instance, has dropped .15c during the past two weeks, and is quoted at from .40 to .45c per lb., according to quantity.

OILS.

The decline in the price of gasoline, fuel oil, mid-Continent crude and Pennsylvania crude, which commenced just about one month ago, has brought quotations down on these commodities to almost unbelievable figures. For instance, Mid-Continent crude is quoted at $1.75 per bbl. at Toronto, and Pennsylvania crude at $3 per bbl. Toronto. At the beginning of the year these were listed at $3.50 and $6.10 per bbl., respectively. Fuel oil has declined from 17c per gallon to 9.2c, and gasoline from 45c to 42 per gallon at service stations. The cause of the slump is mainly due to the poor demand, and for the first time in many moons an over-supply of crude oil is accumulating on this continent. The farmers of the Western States, who annually consume large quantities of both fuel oil and gasoline, are sitting back and refusing to buy until the price suits them. The decline has probably reached the lowest level. "Take a good photograph of these low prices now, for they will soon go up again," said an oil man recently when discussing the market, and though the advance may not occur as soon as some oil men expect, yet one cannot see where such low quotations can exist for any great length of time, for, as every geologist knows, the present oil resources of the United States are fast being depleted.

Naval Stores—Spirits of turpentine have again suffered a drop. There is a large surplus of last year's crop on hand in the States, and while the price may stiffen later on, yet a decline is again about sure to come when the next crop will be ready, which will be six months' time. Rosins are lower, and $10 is the quotation per bbl., on grade G, and $10.50 on the W.W.

Linseed oil has declined 10c per gallon during the past month, and is quoted at 90c in large quantities.

METALS.

The period of depression in the metal trade continues, due to the period of readjustment through which all businesses are passing. The closing down of the British-American Nickel Company's plant at Sudbury during the last week in February is much to be regretted, but credit must be given the company for operating as long as they did in the face of practically no demand. It must also be remembered that this plant was a war industry, and naturally found it hard to continue in normal times, let alone in the present period of readjustment. Copper and lead have both declined during the month, lead having dropped 60c per cwt. and electrolytic copper about 14c per cwt. Improvement in the metal trade is solely dependent on improvement in general business conditions.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals.

Inorganic.

Alum, Ammonia, lump and ground	100 Lbs.	5.50— 6.00
Ammonium Bromide	Lb.	.. — .65
Aluminium Sulphate, high grade, bags	100 Lbs.	. — 4.75
Ammonia, Aqua 26	Lb.	.11— .12
Ammonium Carbonate	Lb.	.16— .20
Ammonium Chloride	Lb.	.15— .20
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .14
Barium Sulphate (Barytes)	Per Ton	40.00—45.00
Barium Chloride	Lb.	.05—.07½
Barium Nitrate	Lb.	.. — .20
Barium Sulphate, B.P.	Per Ton	.. —120.00
Battery Acid, up to and including 1.400 sp. gr.	Cwt.	3.00— 3.50
Battery Acid, over 1.400, up to and including 1.835 sp. gr.	Cwt.	3.50— 4.00
Bleaching Powder, 35% drums	100 Lbs.	.05—.05½
Borax, crystals	Lb.	.09¾— .10
Boric Acid, powdered	Lb.	.. —.18½
Calcium Carbide, car lots, f.o.b. works	Ton	.. —100.00
Calcium Carbide, ton lots, f.o.b. works	Ton	.. —105.00
Calcium Carbide, less than ton lots, f.o.b. works	Ton	.. —110.00
Caustic Soda, ground, drum	Lb.	.06—.06½
Caustic Soda, solid, drum	Lb.	.05¼— 05¾
Calcium Chloride, fused	Per Ton	58.00—60.00
Camphor Monobromate	Lb.	.. — 3.00
Carbon Bisulphide, in drums	100 Lb.	.. — .10
Carbon tetrachloride, drums	Lb.	.18— .20
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	35.00—45.00
Cobalt Oxide, black	Lb.	.. — 3.30
Cobalt Oxide, grey	Lb.	.. — 3.60
Copperas (Iron Sulphate) crystals	Lb.	.. —.02¼
Copperas (Iron Sulphate) sugar	Lb.	.. —.02¼
Copper Sulphate (Blue Vitriol)	Lb.	.09—.09¼
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 1.45
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fuller's Earth, car lots, f.o.b. Toronto	Ton	35.00—40.00
Ferric Chloride, crystals	Lb.	.15— .16
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid, 60%	Lb.	.. — .32
Hydrofluoric Acid, 30%	Lb.	.. — .14
Hydrochloric Acid, carboys, 18	100 Lbs.	2.75— 3.00
Hydrogen Peroxide	Gal.	.. — 1.05
Iodine, crude	Lb.	.. — 4.75
Iodine, resublimed	Lb.	.. — 5.50
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lithopone	Lb.	.09½—.10½
Magnesite, calcined	Per Ton	.. —25.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.18— .20
Magnesium Sulphate	Lb.	.04— .05
Mag. Sulphate, B.P., Medicinal	Single Ton	70.00—75.00
Mag. Sulphate, Technical, car lots	Ton	55.00—60.00
Muriatic Acid, 18	100 Lb.	2.75— 3.00
Nitric Acid, 36 carboys	100 Lb.	.09—.09¼
Phosphoric Acid, 85%	Lb.	.43— .50
Phosphoric Acid, 50%	Lb.	.29— .31
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. — .65
Potassium, Bromide, granular	Lb.	.57— .60
Potassium Bichromate	Lb.	.. — .40
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — ..
Potassium Chlorate	Lb.	.. — .18
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots		.. —.14½
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots		.30— .35
Potassium Hydroxide (Caustic Potash)	Sticks	.. — .80
Potassium Iodide	Lb.	4.00— 4.25
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.65— .70
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Silver Nitrate	Lb.	.. —10.00
Soda Ash, bags	Lb.	.03—.03¼
Sodium Acetate, ton lots or over	Lb.	.. —.12½
Sodium Acetate, lesser amounts	Lb.	.. — .15
Sodium Benzoate	Lb.	.80— .85
Sodium Bicarbonate, 100% pure	100 Lb.	3.85— 4.00
Sodium, Bichromate, bbls.	Lb.	.12— .14
Sodium Bisulphite, powder	Lb.	.. —.09½
Sodium Bisulphite, 35	Lb.	.05½— .06
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.. — .28
Sodium Hyposulphite, kegs	100 Lb.	5.00— 5.75
Sodium Nitrate, refined	100 Lbs.	7.00— 8.00
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	.. — 2.25
	Per Cwt. in Car Lots	.. — 2.00
Sodium Sulphite	Lb.	.. — .07
Sodium Prussiate, Yellow	Lb.	.22— .27
Sulphur, ground	100 Lb.	2.75— 3.00
Sulphur, roll	100 Lb.	4.50— 4.75
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.50— 3.00

Talc, No. 1 grade	Ton	.. —35.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	.. —18.00
Tin Chloride, crystals	Lb.	.40— .45
Tri-sodium Phosphate	Lb.	.08¼—.08½
Ultramarine, Blue	Lb.	.20— .50
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting (English)	Ton	.. —40.00
Whiting (American)	Ton	.. —35.00
Whiting	Per Ton	35.00—40.00
Zinc Sulphate, com.	Lb.	.05¾—.06½
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.13— .15
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.. — .55
Acetic Acid, 28%, carload lots	Lb.	.. —.04½
Acetic Acid, 28%, 25 bbl. lots	Lb.	.. —.05¼
Acetic Acid, 28%, 15 bbl. lots	Lb.	.. —.05½
Acetic Acid, 28%, 10 bbl. lots	Lb.	.. —.05¾
Acetic Acid, 28%, 5 bbl. lots	Cwt.	.. — 5.85
Acetic Acid, 28%, 3 or 4 bbl. lots	Cwt.	.. — 5.90
Acetic Acid 28%, 1 or 2 bbl. lots	Lb.	.. — .06
Acetic Acid, 80%, carload lots	Lb.	.. — .12
Acetic Acid, 80%, 25 bbl. lots	Lb.	.. — .14
Acetic Acid, 80%, 15 bbl. lots	Lb.	.. — .15
Acetic Acid, 80%, 10 bbl. lots	Lb.	.. —.15½
Acetic Acid, 80%, 5 bbl. lots	Lb.	.. — .16
Acetic Acid, 80%, 3 or 4 bbl. lots	Lb.	.. — .17
Acetic Acid, 80%, 1 or 2 bbl. lots	Lb.	.. —.17¼
Acetone, pure, drums or over	Lb.	.. — .20
Acetone, pure, lesser amounts	Lb.	.. — .25
Aspirin, in 100-lb. lots	Lb.	.90— 1.05
Alcohol, acetone, bbls. or over	Gal.	.. — 2.00
Alcohol, acetone, lesser amounts	Gal.	.. — 2.25
Alcohol, pure, bbl., 65% O.P.	Gal.	.. —10.50
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 1.75
Alcohol, wood, 95%, half bbl. lots	Gal.	.. — 1.85
Alcohol, wood, 95%, lesser amounts	Gal.	.. — 2.00
Alcohol, wood, 97%, bbls.	Gal.	.. — 1.78
Alcohol, wood, 97%, half bbl. lots	Gal.	.. — 1.90
Alcohol, wood, 97%, lesser amounts	Gal.	.. — 2.05
Amyl acetate, technical	Gal.	4.75— 5.25
Amyl acetate, pure	Gal.	5.75— 6.25
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — 1.25
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 1.60
Carbolic Acid, white crystals	Lb.	.. — .30
Chloroform	Lb.	.57— .75
Citric Acid, domestic, crystals	Lb.	.. — .70
Coumarin	Lb.	.. — 6.00
Cream Tartar, 98%	Lb.	.45— .55
Dextrine	Lb.	.. — .09
Ether, Sulphuric	Lb.	.35— .50
Formaldehyde, bbls. or over	Lb.	.. — .25
Formaldehyde, 200-lb. kegs	Lb.	.. — .28
Formaldehyde, 100-lb. kegs	Lb.	.. — .29
Formaldehyde, 50-lb. kegs	Lb.	.. — .30
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Gallic Acid	Lb.	1.25— 1.75
Glycerine, C.P., single tin of 56 lbs.	Lb.	.. — .35
Glycerine, C.P., two or more tins	Lb.	.. — .33
Glycerine (pale straw) single tin 56 lbs.	Lb.	.. — .34
Glycerine (pale straw) two or more tins	Lb.	.. — .32
Hexamethylenetetramine		1.10— 1.50
Oxalic Acid	Lb.	.25— .30
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.50
Phenolphthalein	Lb.	.. — 2.10
Pyrogallic Acid	Lb.	3.00— 3.50
Quinine	Oz.	1.00— 1.10
Saccharin	Lb.	4.50— 5.00
Salicylic Acid	Lb.	.40— .45
Stearic Acid, Double Pressed	Lb.	.23— .27
Stearic Acid Triple Pressed	Lb.	.26— .30
Tartaric Acid, crystals or powdered	Lb.	.45— .55
Tannic Acid, commercial	Lb.	.. — .60

Rubber.

The following quotations on rubber are in American funds, New York delivery:

Crude.

Para, upriver	Lb.	.. — .18
Caucho Ball, upriver	Lb.	.. — .15

Plantation Rubber.

1st Latex Crepe	Lb.	.. — .19
Smoked Sheet	Lb.	.. —.18½

Scrap Rubber.

Boots and shoes	Lb.	.04— .05
Automobile tires	Lb.	.. — .01
Steam and fire hose	Lb.	.. —.01¼
Inner tubes, No. 1	Lb.	.. — .08
Inner tubes, No. 2	Lb.	.. —.05¾

Tanning and Dyeing Materials

Fustic Crystals	Lb.	.30— .35
Hematine Crystals	Lb.	.25— .28
Logwood Crystals	Lb.	.34— .36
Quercitron Liquid Extract	Lb.	.09— .10
Liquid Sumac Extract	Lb.	.07— .08
Ground Sumac	Ton	75.00—85.00
Chestnut Liquid Extract	Lb.	.3½— .04
Hemlock Liquid Extract	Lb.	.06— .07
Quebracho Liquid Extract	Lb.	.5½— .06
Quebracho Solid Extract	Lb.	.07—.07½
Liquid Blended Extract (Canadian)	Lb.	.4¾—.05¼

Metals.

Aluminium, No. 1, 98-99%	Lb.	.. — .33
Antimony	Lb.	.. —.08½
Brass, yellow ingots	Lb.	.. — .16
Brass, red	Lb.	.. — .18
Cobalt, metal	Lb.	.. — 4.50
Copper, electrolytic, small lots	Cwt.	.. —16.62½
Copper, electrolytic, car lots	Cwt	.. —16.12½
Copper, casting, small lots	Cwt.	.. —15.62½
Copper, casting, car lots	Cwt.	.. —15.12½
Gold, Pure	Oz.	23.00—25.00
Iron, Pig	Ton	.. —43.00
Lead, pig, small lots	Cwt.	.. — 5.80
Lead, pig, car lots	Cwt.	.. — 5.30
Magnesium, ribbon	Lb.	.. —18.00
Magnesium, powder	Lb.	3.00— 3.50
Mercury	Lb.	.. — 2.50
Nickel, shot or ingot	Lb.	.. — .40
Platinum, pure	Oz.	85.00—90.00
Silver, bar, American silver	Oz.	.. — .99
Silver, bar, Canadian produced, U.S. funds	Oz.	.. — .54
Steel, mild, ¼ inch, base price	Cwt.	.. — 5.75
Steel, mild, 3/16 inch, base price	Cwt.	.. — 6.25
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	8.15— 8.50
Tin	Lb.	.. — .45
Zinc, sheets	Lb.	.. — .22
Zinc (spelter) small lots	Cwt.	.. — 7.00
Zinc (spelter) car lots	Cwt.	.. — 6.50

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .38
Motor Gasoline (service stations)	Gal.	.. — .42
Lighting Gasoline	Gal.	.. — .47
Naphtha	Gal.	.. — .37
Coal Oil	Gal.	.. — .27
Fuel Oil	Gal.	.. —.09.2
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 1.75
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 3.00
Crude Creosote Oils, bbls.	Gal.	.. — .40
Refined Creosote Oil, bbls.	Gal.	.. — .55
Crude Coal Tar	Bbl.	.. — 9.20
Refined Coal Tar	Bbl.	.. —10.50
Coal Tar Pitch, bbls.	Cwt.	.. — 1.90
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52— .57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .12
Naphthalin Balls	Lb.	.. — .18
Alpha-Naphthylamin	Lb.	.45— .50

Flotation Oils and Naval Stores.

Spirits of Turpentine, in bbl. lots..(Imp.)	Gal.	.. — .88
Rosin, Grade G, in 280 bbl. lots		.. —10.00
Rosin, Grade W.W., in 280 bbl. lots		.. —10.50

Gums and Vegetable Oils.

Vegetable Oils—

Anise Oil	Lb.	2.10— 2.25
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .21
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .19
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.30— .32
Linseed Oil, raw, in bbl. lots ....(Imp.)	Gal.	.. — .90
Linseed Oil, boiled, in bbl. lots ...(Imp.)	Gal.	.. — .93
Monopole Oil	Lb.	.. — .30

Gums—

Indian, No. 1A	Lb.	.. — .40
Indian, No. 1	Lb.	.. — .38
Tragacanth, No. 1, Ribbon	Lb.	.. — 4.50
Tragacanth, No. 1, Flake	Lb.	.. — 3.50
Tragacanth, Turkey	Lb.	.. — 3.75
Arabic, clear amber sorts	Lb.	.. — .18
Arabic, regular grain No. 4 and No. 6	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22¼
Arabic, white sorts	Lb.	.. — .40
Arabic, powdered, No. 1	Lb.	.. — .25
Arabic, powdered, No. 2	Lb.	.. — .24

Fertilizer Materials

Animal Tankage, per unit of Ammonia		7.00— 7.50
Animal Tankage, per unit of Bone Phosphate of lime		.. — .10
Nitrate of Soda	Ton	100.00—105.00
Muriate of Potash	Cwt.	7.00— 7.50
Pure Ground Blood, per unit of Ammonia		6.50— 7.00
Steamed Bone Meal	Per Ton	65.00—70.00

C. P. Chemicals.

Ammonia, C.P.	Lb.	.. — .26
Hydrochloric Acid, C.P.	Lb.	.. — .15
Nitric Acid, C.P.	Lb.	.. — .23
Sulphuric Acid, C.P.	Lb.	.. — .14

CANADIAN CHEMISTRY AND METALLURGY

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P. F. McCLEARY, Associate Editor. T. LINSEY CROSSLEY, Editor. L. E. WESTMAN, Business Manager.

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EDITORIALS

THE AUGUST MEETING.

THIS is to be a banner year for Chemistry in Canada, and one that will long be remembered. The Annual Meeting of the Society of Chemical Industry is to be held in Montreal, August 29th to 31st.

For those who a generation ago established the first Canadian Section of the Society at Toronto following a small dinner held in the old Front Street offices of the Canadian Manufacturers' Association, the occasion will be one giving extreme satisfaction.

Now, for the first time, the Annual Meeting of the whole Society will be held in Canada in recognition, we believe, of the development that has taken place here, and is certain to come in future. We cannot do better at this time than remind all Canadian chemists that an event of such importance is awaiting their participation. Already a message has gone forth in the happily chosen words of the official Journal of the Society.

"The Council wishes it to be known that it attaches very great importance to this visit both from the standpoint of the future development of this Society and from that of the national welfare. The value, both actual and prospective, of Canada and of Canadian chemical industry to the Motherland, and to the Empire, must be apparent to all whose interests extend beyond the immediate objects of sense-experience. By taking part in this visit to our kith and kin in Canada and the United States, members (and their friends) will not only be able to obtain first-hand knowledge of important chemical industries, learn something of new and improved methods of work and organization, and exchange views and information mutually advantageous, but they will also be afforded opportunities of strengthening ties of friendship that already exist, so paving the way to better understanding, greater appreciation, and more effective co-operation between the Old World and the New."

SCIENCE IN GOVERNMENT AND INDUSTRY.

WE read the "New Republic" with refreshment, if not with unruffled calm. In the issue of March 30th, there is an editorial on the slogan, recently adopted by the Chambers of Commerce of the United States: "More business in government, less government in business." After citing the fact that business is in reality always calling upon the government to help it in its difficulties by various forms of legislation, the article says:—

"When business confesses in this way its incompetence to manage its affairs successfully without calling in government, what reality is there in the demand for an increase of the business element in government? Government does not need an infusion of the waste and selfishness of private business. It already has that. What it needs is an infusion of the disinterestedness and realism of science."

Our present system of government has developed from the feudal system. It carries, naturally some of the family traits. This is not only the case in monarchy, but in the republic.

In addition to the nominal head, whether president or king, there are Cabinets, Senate and Commons, or Senate and Representatives.

The fundamental principle is that we are self-governing, but the machinery indicates that we are not, else why three tribunals to three-hash everything our elected representatives decide upon? There is nothing scientific about the whole works.

We do not include the excellent officials in some departments, but they have nothing to do with the government. They exercise a more invisible function in government than the minority voter.

There is no science in the party form of government. Its working principle is that of exigency, in which every other interest is sacrificed to party advantage.

We are confronted with housing problems, fuel problems, health problems, transportation problems, with education, immigration, conservation and cultivation problems. What is there about the party system of government that renders it so peculiarly suitable for supplying these national hungers and thirsts, that we insist on its perpetuation?

In our industrial life we find similar lack. We could point to several apparently successful concerns, as far as profits go, run by financiers, accountants, graduated office boys, anything but scientists, and when we go into their plants we note gross waste and disregard of scientific principles. This is not universal because some of these men understand the need for technical assistants. Profits of course can be made as long as the consumer will stand it. For example, a short time ago ground wood pulp was selling around one hundred dollars a ton. Today we have heard of quotations about forty and even in one case of much lower. The

manufacturing costs, especially labor, have been subject to very little change in the meantime. It is easy to see how profits in such a case must have been just a matter of book-keeping, so long as anything was going through the mill. It may require something more than book-keeping soon.

We have all seen expensive automatic devices installed for registering temperature, humidity, carbon dioxide, pressure and other factors, and in many cases we have found them not running because there was no one in the plant who could make use of the information they supplied. A machine can do anything but think. Someone should be thinking inside the works, as well as in the office. Yet it is generally considered that a man is earning when he uses a monkey wrench, and loafing when using a slide rule. It is a sad commentary on the administrative genius of business today, that the big salaries are usually in the sales departments. Little wonder that the actual producers work under a sense of injustice, and that the product is high-priced and deficient in quality.

There has recently been a warm interchange of opinion on the relative durability of aluminum ware. We are not going to take sides in the matter, believing that both parties are making sweeping generalization, which would be hard to prove.

Personally we have wondered why a little more attention could not be given to the rivets on said ware, which we have laboriously hammered up on more than one occasion.

We believe that wherever such material is made, the scientifically controlled product will stand the severest use. The industry in which scientific control is not required is not fitted for this planet. Even in such work of the soul as violin construction we are informed that the secret of the "Strad" lies in the synchronizing of vibrations in body and strings by the use of a special varnish.

The relations between government and industry must be more and more founded upon scientific considerations. This does not mean that chemist, physicist and engineer should predominate, that would be as unscientific as any other one-sided plan.

One may be scientific as a lawyer or financier. What is needed is the scientific method in place of the present unscientific methods, both in government and industry.

A NEW MEMBER OF THE FAMILY.

"SCIENTIFIC AGRICULTURE", we welcome, also it's parent the Canadian Society of Technical Agriculturalists. Both doing nicely, thank you.

We advise this infant to holler for all it's worth, for soil food. We believe it has a bright future, and shall be glad to hear of it teething soon for the heavy diet before it.

This latest addition to the scientific press of Canada, has a real function to fulfill for agriculture and we congratulate the publishers, Industrial and Educational Publishing Co., Ltd., Montreal, and the editor, Dr. F. H. Grindley.

A SMALL CLOUD.

A SMALL cloud, possibly no greater than the one referred to as being the size of a man's hand, passed over the House of Commons at Ottawa recently.

We refer to the resolution with regard to the natural resources of the Dominion brought in by a member of the Government on March 14th and duly supported by the opposition, but turned down by the Government. Obviously the Government could not well support it without committing themselves to something which they are not prepared to follow up at the moment. However, it should be remembered that the opposition did support the resolution.

This resolution called for a constructive industrial policy of a progressive nature to be applied to the development of our resources along economic and scientific lines. Those who brought it in and supported it, are to be recommended for their action. Those who spoke to the motion upon narrow lines, limiting their remarks to local matters contributed something, and gave hopeful indications that as the vision of the possibilities becomes clearer they may see the national significance of questions they now consider from a local standpoint.

This is, generally speaking, true that in any country properly managed where scientific knowledge is fostered and applied, an industrial progress may be stimulated which in one generation will make the world dependent upon that country in many ways. There is not a Canadian industry or individual business which could not be revolutionized or infinitely advanced by the more complete application of present scientific knowledge or new knowledge made possible by research. If manufacturers and members of the Government could only get that idea thoroughly digested and applied, we would be able to accelerate much faster than we now are.

Now there are certain large industries or basic ones which should be tackled first, with the idea that if they are placed on a proper footing, other things will follow more readily.

The development of one resource makes another possible, and technical advances in one field assist progress elsewhere. England supported her trade fabric by exporting coal; Germany entered into the field with products obtained from coal. Iron and

oil developments have always been basic to the strength of a country. With this in view is it unreasonable to suggest that the Government give the greatest care and attention to the development of our coal, iron and oil resources? Some thought is being taken with regard to oil. Only large capital can hope to do these things. Either the Government, or some large organization, British, Canadian or otherwise, can hope to succeed in reasonable time. Alberta with enormous coal reserves must be treated as a unit. Small producers must get together to mutual advantage. Canadian iron ores must be worked up in some way, and we have not done our duty until we have exhausted thoroughly all means available in a study of their economic usefulness. If these developments are fostered and guarded as they should be, a basis is laid down which will support an agricultural, lumbering, mining and general manufacturing fabric worthy of a nation and the resources of the Dominion. We believe that some day a resolution such as was so recently turned down, will pass the Dominion Government, a development policy will be created and a real hearing given to those who have some conception of the scientific economic application of research and capital to modern industrial problems.

WHEN HE HAD SPENT ALL.

ONE of the finest climaxes in narrative literature occurs in that sentence from the Prodigal Son:—

"When he had spent all, there arose a mighty famine in that land."

Prodigal sons are we all, and it's getting pretty near time that we came to ourselves. Responsible people who live steady, honest lives, will not consider themselves prodigal, and if you should ask one of them why he doesn't do as much with his left hand as he does with his right, would fail to connect his sinister disability with any sort of prodigality. But is it not a fact that we have become habituated to a specialized use of the right hand and more or less wasted the left? Few of us are using the powers with which we have been entrusted.

When we call for more production does it appeal to our own conscience? Are we putting out our best efforts? Are our pleasures mere pastimes, or do they have our best endeavors? Our hobbies should indicate whether we are producers or just barnacles. If we are barnacles we are prodigals because the equipment entrusted to us is capable of an output beyond the dreams of barnacledom.

We know we can do more. Here's a man who has just blown in on a new car; never knew anything about engines, pistons, cylinders, magnetos, air pumps, traffic laws, gasoline or lubricants, yet in a month he will have acquired an amazing amount of technical detail. Another takes to golf—never mind the detail, but what a lot he knows in a month or two. How little we develop from that profound and inscrutable mechanism centred in the brain, so elastic and absorbent, so sadly limited by lack of incentive, something that apparently must be set in motion from outside. We are thus not only responsible for lack of output ourselves, but we are mutually responsible for lack of stimulus to others. We talk of conservation of resources and only think of material things. Are we not thus prodigal of our own mental and physical powers? The amount of mental power wasted by a large proportion of our fellow citizens, in pastimes, movies, professional sports, watching others play; we are responsible for some of it. Do we give a thought, or any time, to help these non-used mental powers to produce more? Those of us who have enjoyed the stimulus of better things—in many cases by sheer force of circumstances, by natal accident—what have we to our charge that we have not inspired others? If the evil one, walking up and down in the earth, and going to and fro in it, has much to chuckle about, a large portion of it might be due to the failure of good men to inspire others.

One child taking piano lessons seemed to make little progress. His mother went to see the teacher about it and found a badly lighted room with nothing in it but piano and stool, with chair for teacher. There was no inspiration.

How much of the unrest and crime now so rampant is due to this wasting, in disuse, of inspirational substance?

If we come to a famine of civilization will we have to go to the swine and husks for what has been squandered in the past of joyful incentive not shared with our fellows?

DEATH OF DR. HENRI ST. GEORGE.

Dr. Henri St. George, Ph.G., Ph.L., M.D., D.P.H., City Analyst, Montreal, died suddenly, April 1st, at his residence, 157 St. Denis Street. He was one of the best known chemists and bacteriologists in Eastern Canada, and was a Fellow of the Canadian Institute of Chemistry.

Robert Meldrum, chemist, formerly of London, England, has taken a position with the Canada Bread Co., Ltd., Toronto. He will establish a new laboratory for this company.

Mr. Garnet P. Ham has become associated with the Dellca Laboratories, Inc., of Chicago, Ill., as superintendent of research, and expects to take up his new duties early in April.

Hydrated Lime---A Chemical Engineering Product

By LUCIUS E. ALLEN

THERE has arisen of late years considerable discussion among those following the various engineering professions as to just what constituted a chemical engineer. To some the chemical engineer has appeared to have grown up in their midst as a sort of hybrid, whose growth had been so rapid that like the familiar cabbage, instead of one solid head appearing on one root, two heads appeared, in many cases both being cracked due to rapidity of growth. However, it is gratifying to see that the chemical engineer is to-day filling an increasingly important place in the engineering and business world.

The chemical engineer may be defined as one who manages enterprises requiring the knowledge and application of chemistry. The development, manufacture and use of hydrated lime may well represent a typical example of what constitutes the realm of chemical engineering as applied to one of the most common and useful products of nature.

Historical Development.

It is possibly difficult to state how early in the world's history lime was first produced or used, but it is safe to assume that at whatever age man first built the crude bonfire on some flat ledge of limestone, lime was first produced. The ancient Egyptians knew the art of producing lime as is evidenced by an examination of mortar used in building construction in those days. The Romans apparently more fully recognized the value of lime and calcined calcareous products and produced the so-called Roman cement. The early French and English knew the process of slacking lime, and the necessity for thorough burning and slacking of the lime before using it in mortars. Old lime pits may still be found in France and England which were used to slack or "soak" the lime before being mixed into mortar.

The modern development of the production and use of lime and hydrated lime is, however, of quite recent date, and can truthfully be said to have commenced with the advent of the trained chemical engineer. The mechanical processes necessary to produce a commercially high grade hydrated lime have been evolved and perfected within the last fifteen years, in fact the first modern hydrated lime plant to be built in England was shipped from Chicago about eleven years ago.

Chemical and Physical Qualities of Lime.

Before considering the installation of a hydrated lime plant, a thorough investigation of the quality of the limestone and quick lime produced from this limestone should be made. Many limestones that when calcined will produce a lime suitable for ordinary building purposes will not be at all adapted for conversion into hydrated lime. Some limestones contain too high a percentage of iron to produce a commercially white hydrated lime, while others may contain flinty nodules that will not calcine or hydrate and are difficult to pulverize to the proper fineness.

Two well known reactions are involved in converting limestone into hydrate lime, namely:

1. Limestone, plus heat drives off the carbon di-oxide contained in the limestone and produces calcium oxide, or quick lime.

2. Calcium oxide (lime) plus water chemically hydrates the lime and produces calcium hydroxide, or hydrated lime.

For purposes of a proper classification all limes are graded as follows:

1. High calcium, not less than 90% calcium oxide.
2. Calcium, not less than 85%, nor more than 90% calcium oxide.
3. Magnesian, not less than 10% nor more than 25% magnesia.
4. High magnesian, not less than 25% magnesia.

There are doubtless more uses for a high calcium lime for chemical and industrial purposes than for a high magnesian lime, and while it may be conceded that a high magnesian lime is better adapted for plaster mortars, the many recent improvements that have been made in the methods of hydration of high calcium lime have overcome to a large extent the objections to the use of a high calcium for plaster mortars. The following analyses of a high calcium and a high magnesian hydrated lime are submitted as typical examples of these two classes of hydrated limes.

	High calcium hydrated lime.	High magnesian hydrated lime.
Siliceous residue	1.67%	1.08%
Iron and alumina	0.70	0.80
Calcium oxide	65.85	48.40
Magnesium Oxide	1.92	34.16
Loss on ignition	28.20	15.30

The loss on ignition represents approximately the amount of water required to hydrate the quick lime and to convert it into a stable product in the form of a very fine white fluffy powder.

Manufacturing Process.

1. Crushing—After the limestone has been properly calcined in either vertical or rotary kilns, it is cooled and then passed by suitable belt or pan conveyors to the crusher. The lime is usually crushed to such a size that it will all pass a one-half inch ring or screen. In some cases and with certain limes it is necessary to reduce the lime to a granular powder before it is hydrated. Owing to the physical character of burned lime, the ordinary gyrator or jaw crushers do not work satisfactorily, and some type of disc or pot crusher should be used.

2. Hydration—The next step in the process is the hydration or slacking of the crushed lime by the addition of the proper amount of water, the process being carried out by means of a hydrator. Hydrators may be divided into two general classes, (a) continuous hydrators, and (b) batch hydrators. Both types of hydrators are extensively used, the Kritzer continuous hydrator and the Clyde batch hydrator being the two most commonly used types of hydrators.

The Kritzer continuous hydrator may be described as consisting of a series of several cylinders of varying diameters, but of equal length, mounted horizontally one above the other on a steel framework, the diameters of the cylinders increasing from top to bottom. Within each cylinder is a shaft to which are attached steel paddles which not only serve to agitate the lime continuously and bring about thorough hydration, but also act as a conveyor to push the lime forward from one cylinder to another. In operation the crushed quick lime is fed into the top cylinder, the correct amount of water being added through spray nozzles at the same time. Hydration commences immediately, the heat due to the hydration of the

*Paper presented at Toronto Meeting, Engineering Institute of Canada, Feb. 2 and 3, 1921.

lime accelerating the reaction, so that the hydration takes place quickly.

The temperature in the top cylinder will vary from 80 degrees to 90 degrees Centigrade, depending largely on the chemical composition of the lime being hydrated, a high calcium lime usually producing higher temperatures than a high magnesian lime. A certain amount of steam is generated in the cylinders due to the heat of hydration, and this passes up through the various cylinders and out through a stack provided on the top cylinder. The successful operation of the Kritzer continuous type of hydrator depends very largely on the careful regulation and control of the amount of water admitted to the hydrator, as too little water will produce unhydrated lime and an excess of water will produce a hydrate that is damp or wet and renders subsequent screening or grinding very difficult. The capacity of the Kritzer hydrator depends on the size and number of cylinders as well as the kind of lime to be hydrated, but will range from 4 to 6 tons per hour.

In the Clyde batch hydrator the crushed lime and water are both weighed or measured and admitted to the hydrator in batches. The Clyde hydrator consists of a steel pan about ten feet in diameter which rests on ball bearings and is made to revolve by suitable gearing. The steel pan is tightly covered with a sheet iron hood and stack. Suspended from a stationary framework within the pan is a series of steel plows or blades which keep the lime stirred up as the pan revolves, and also assists in discharging the lime after hydration is complete through a trap located in the centre of the pan. From 1,500 to 2,000 pounds of lime are treated each batch, the time required being from 10 to 15 minutes for each batch.

3. **Screening and Pulverizing**—After hydration and discharge from the hydrator, the hydrated lime may still contain some small particles of unhydrated lime or core which it is necessary to remove entirely from the finished product by screening, or further pulverization. If screening is adopted, the hydrated lime is passed through a mechanical screen or separator, the two types most commonly used being the Newaygo separator and the Columbian screen. These separators entirely remove all unhydrated particles or core, and the tailings are either pulverized and sold as a separate product, or pulverized and returned to the hydrator for further hydration.

If it is desired to utilize the screenings, it is preferable instead of screening to pass the entire product coming from the hydrator through some form of pulverizer to reduce all coarse particles to a uniform fineness. The Raymond or Lehigh-Fuller mills are adapted for this purpose.

4. **Packing and Storing Hydrated Lime**—As hydrated lime is an extremely fine and fluffy powder, it is necessary to employ special machinery for packing or sacking the product. The Bates valve bagging machine was invented and perfected for this purpose and is almost universally used for sacking hydrated lime. A special type of paper valve bag is used which is self sealing after being filled and makes a compact package weighing forty pounds net of hydrated lime. While hydrated lime is a perfectly stable product as compared to ordinary lime, it should nevertheless be stored in a dry place, and if so stored will keep almost indefinitely, in fact the stability of hydrated lime is one of its most valaublе features.

Mechanical Uses of Hydrated Lime.

1. **Waterproofing Concrete Work**—Until recent years very little accurate data had been secured as to the many advantages of the use of hydrated lime in conjunction with portland cement concrete. In 1909 in a paper before the Canadian Cement Users' Association,* the writer called attention to the successful use of hydrated lime as a waterproofing agent in concrete work, and it is gratifying to note that its use has now become quite general.

The following series of tests conducted by Sandford E. Thompson, Boston, Mass., indicate the advantages of hydrated lime as a waterproofing agent:

Concrete of 1—2—4 mixture, hydrate lime added; specimens were 4 inches thick, water pressure was 80 lbs. per square inch.

Percentage of hydrated lime.	Flow in grams per minute At 14 days.	At 21 days.	At 28 days.
0.0	5.52	2.92	1.91
2.0	9.20	2.55	1.63
4.0	2.82	1.49	0.76

In another series of tests by Mr. Thompson the specimens were concrete cubes in which iron pipes were imbedded, through which the water pressure could be applied. The results were as follows:

Tests on Concrete Cubes in Which Iron Pipes are Imbedded, Through These Water Pressure Could be Applied.

	Flow Under 7-Ft. Head.			Flow Under Pressure of 60 Pounds per Sq. Inch.			
Percent hydrated lime	Age in days	Duration of measured flow in hours	Flow in grams per hour	Age in days	Pressure applied before measure in hours	Duration of measur- flow in hours.	Flow in grs. per hour
1—2—4 Concrete							
1	18	161	2.7	40	24	4½	74.8
41	18	161	2.1	41	18	5	28.4
7	18	161	1.0	42	18	6½	5.2
10	15	161	1.0	46	6	18	1.6
1—2.5—4.5 concrete							
0	30	169	1.9	45	18	6	32.5
10	29	169	0.8	49	..	11	0.0
14	29	169	0.7	50	..	27	0.0
1—3—5 concrete							
0	26	169	9.8	50	6	14	70.6
8	26	169	1.1	51	8	17	306
14	28	169	1.1	50	28	13	10.7
20	28	169	1.2	53	9	15	0.7

In connection with these tests Mr. Thompson further says:

"The cost of large waterproof concrete structures frequently may be reduced by employing leaner proportions of concrete with hydrated lime admixtures, and small structures, such as tanks, may be made more watertight. Although the character of the sand and stone used in the concrete will affect the best percentage of lime to use, the present materials are representative of average materials throughout the country so that the results should be of general application. Coarser sand would naturally require slightly larger percentages of lime, and finer sand (that is sands having a larger percentage of fine grains, which pass a sieve with 40 meshes to the linear inch) would be apt to require less lime since sand containing considerable fine material produce a more watertight concrete."

In connection with the second series of tests here shown, it may be of interest to note that Mr. Thompson used a pressure of 60 pounds per square inch, or the equivalent of about 140 feet head, which is far in excess of pressure met with in ordinary engineering practice.

The United States Bureau of Standards have also carried out an exhaustive series of tests† of various waterproofing mixtures in which the results were summarized in the following words: "This (hydrated lime) is the most efficient medium employed and resulted in an almost impermeable mortar at the two weeks test. Its value is probably due to its void-filling properties, and the same results could be expected from any other finely ground inert material, such as sand, clay, etc."

As density of concrete is the prime requisite to secure permanency of concrete structures subjected to the action

*Modern methods of waterproofing concrete.
†U.S. Bureau of Standards Technologic Paper No. 3.

of sea water, hydrated lime has been found to be one of the best agents known for this purpose. European practice has very generally adopted the use of hydrated lime in all floating and fixed marine structures. In the construction of reinforced concrete oil carrying barges, in which the inner side of the concrete is exposed to the action of crude oil and the outside to that of sea water, the use of hydrated lime has been found to be very satisfactory. Dr. William Michaelis, an international authority on marine concrete, also advocates the use of hydrated lime for all marine concrete work. In the construction of large concrete tanks for the storage of water, ammonia, oil, etc., the use of hydrated lime has been found to give the best results.

2. **In Concrete Highways**—With the rapidly increasing use of concrete as a material for the construction of our main highways, many problems have arisen as to its suitability and durability. Due to the excessive motor truck traffic on some of our main highways, it has become necessary to secure a very dense concrete to withstand the shock and wear of this traffic. To determine the relative value of using various percentages of hydrated lime with concrete for concrete highways, the State Highway Department of Delaware carried out a most interesting series of tests some three years ago.

It is now well established that the strength of concrete is governed very largely by the volume ratio of water to cement. It may be stated that a ration of 0.4 of water to 1 of cement produces maximum strength, while a ratlon of 2 to 1 gives very little strength. Under practical working conditions, however, it is difficult and unusual to mix and place concrete using the minimum ratio of water. If hydrated lime is added, greater workability is imparted to the concrete with a minimum ratio of water, thus securing the most effective results, and a concrete of maximum density. The results of the tests made by the Highway Department of the State of Delaware are here appended as illustrating this point:

"The specimens were 6" x 12" cylinders and were made at the same time the concrete was bing placed upon the roadbed. A chute mixer was used. The cylinder form was filled by holding it under the chute and deflecting the flow of concrete from the road into the form. All specimens of one mixture were taken from the same batch in the mixer.

"The specimens were not tamped, but were struck off on top and then were covered in order to protect them from the rays of the sun, this being identical with the treatment given the road. After being covered for 24 hours they were buried at the side of the finished concrete road, and at the time when moist earth was thrown on the road the specimens were included under this covering. They were left in place until they were six months old and received the same treatment as the road during this period and then taken to be broken."

"As the tests were started in November, it will be seen that the specimens were subjected to the Fall, Winter and Spring periods."

"Consistency of the mixture was determined by the inspector and myself in accordance with our ideas of an ideal working consistency. The amount of water was not measured, as it was not practical under the circumstances, but the same consistency was maintained during the mixing by the agreement of opinions of the man running the mixer, the inspector and myself; that is, the specimens were poured when the consistency was unanimously agreed to by the three parties as being the same as that of the previously made specimens."

At the end of the six months period, the specimens were removed to the laboratories of the Henry S. Spackman Engineering Co., of Philadelphia, for breaking uncer compression with the following results:

COMPRESSIVE STRENGTH.

Percentage of Hydrated Lime Based Upon the Weight of Portland Cement in the Mixture.

Mixture 1—2—4.

	0% Lime lbs. per sq. in.	2½% Lime lbs. per sq. in	5% Lime lbs. per sq. in.	7½% Lime lbs. per sq. in.
	3108	2908	3596	3514
	2203	3640	4381	5092
	2529	3476	3473	4498
Average...	2613	3341	3816	4368

In hreaking under compression, it was noted by the laboratory that failure of the coarse aggregate occurred in every case.

Chemical Uses of Hydrated Lime.

While the purely mechanical uses of lime and hydrated lime are perhaps more familiar to the civil and mechanical engineering professions, and at first thought would be considered as consuming the greater tonnage of lime, nevertheless the greater tonnage is used by chemical manufacturers.

It would be impossible within the scope of this paper to treat of all the various uses of lime in the chemical trades and, therefore, only a few of the more important will be mentioned. Statistics for the year 1918 in the United States show that 26 per cent. of the chemical lime produced was used in the alkali industry; 15 per cent. in the manufacture of calcium carbide; 7 per cent. in the manufacture of acids, and 7 per cent. in the manufacture of bleaching powder, the balance being widely distributed in a variety of industries. Lime or hydrated lime is used to a greater or less extent in the following lines of manufacture: alkalies, calcium carbide, cyanamid, ammonium nitrate, bleaching powder, fertilizer, sand-lime brick, glass, ceramics, water purification, paper and pulp, sugar, paints, tanning, insecticides, illuminating gas and ammonia. There are some lines of chemical manufacture in which limestone, lime or hydrated lime may be used interchangeably with equally good results, while others require the use of lime or hydrated lime only. Hydrated lime can be manufactured that will contain minimum percentages of impurities, such as silica, alumina and iron, and for that reason if a very pure lime is desired or required in a certain process, hydrated lime is preferable to ordinary bulk lime.

It is a stable product, does not air slack, and is put up in convenient sized packages for handling. It may be of interest to state in conclusion that some of the best chemical engineering talent on this continent are now working out new uses for hydrated lime, and perfecting processes for producing the highest grade product possible; and it may be safely predicted that lime, one of the first and oldest chemical products known to civilized man, may yet become one of the most important as well as essential commodities produced by the chemical engineer.

Sir Stofford Brunton, McGill University, has made an examination of a small specimen of pitchblende from Conger township, near Parry Sound, Ontario, and reports that the specimen showed satisfactory evidences of radioactivity. He found it had 4½ times the radioactivity of samples of pitchblende from Bohemia, which is the ore from which Madame Curie originally extracted radium.

VEGETABLE OILS*

With Special Regard to the Manufacture of Food Products from Edible Vegetable Oils

By H. TEFFT†

ROUGHLY speaking vegetable oils can be divided into two classes, domestic and oriental. The domestic oils, i.e., produced on the North American continent, are cottonseed, linseed, peanut, castor, corn and sun-flower. The oriental oils are cocoanut, palm, palm-kernel, soya-bean, rape-seed and peanut. There are also a number of other oriental oils but they are produced in such small quantities that they are as yet comparatively unimportant commercially. The Phillipine and South Pacific Islands and the Malay Archipelago are the big producers of copra and cocoanut oil. Palm oil and palm-kernel oil come chiefly from Africa, and soya-bean, rape-seed and peanut-oil from China. Of the oils produced upon the North American Continent, England manufactures large quantities of cotton-seed oil from Egyptian and Indian cotton-seed. The oil produced is inferior to the American oil on account of the deteriorated condition of the seed when it arrives at the English mills.

Another classification of these same oils is commercial oils and edible oils. By commercial oils, are meant oils that are used for manufacturing some inedible product, such as paint. Divided in this manner, the edible oils would be cotton-seed, peanut, corn, sun-flower, cocoanut, palm, palm-kernel and soya-bean. The commercial oils would be linseed, castor and rape-seed. Some of the oils are in both classes. For example, cotton-seed oil is used in the manufacture of soap. There are also attempts being made to produce edible linseed oil.

Edible Vegetable Oils.

As the writer has had very little practical experience with the manufacture of commercial oils as above defined, statements in this paper will be confined to the edible vegetable oils.

Most of the oils mentioned are obtained from the seed of the corresponding plant and there are three principal methods. Extraction, expeller pressing and hydraulic pressing or combinations of the three methods. Of these three methods probably extraction is the least used. It consists of treating the seed with a volatile solvent which is afterwards distilled off, leaving behind the oil in question. The disadvantages are loss of solvent and contamination of the oil with the solvent.

Cold-pressed oil is made by feeding the cleaned seed into a special type of press and obtaining the oil direct. For some reason or other this apparently very simple method has not displaced very rapidly the older hot-pressing method. One of the disadvantages is that the residue obtained after the oil is expressed, contains the hulls of seeds and consequently is not as desirable as a cattle food.

The oldest method and the one most generally in use is the hot pressing method. In this method the seeds are cleaned and the meats removed from the shells or hulls and these meats are then given a slight cooking to burst the oil cells and the cooked meats are folded into camel's hair cloth and subjected to pressure in an hydraulic press. Afterwards the contents of the press clothes are shaken out, ground and used for cattle food.

The three methods, as above outlined, apply more particularly to the manufacture of cotton-seed oil but in a general way they apply also to sun-flower, soya-bean, linseed, castor, palm-kernel, and rape-seed oils. In the case of corn-oil, the oil is obtained from the germ of the kernel of corn after both hull and meat have been removed. Cocoanut oil is obtained from copra, which is the dried meat of the cocoanut and the quality of the oil obtained, varies almost directly with care and method of drying. Some copra is sun-dried; some, fire-dried; and in some places the copra is boiled on the spot and the oil skimmed off the top of the water as fast as it accumulates. Palm oil is made from the outside fleshy part of the fruit of the palm tree. As this part of the fruit has to be removed in order to obtain the kernels for palm-kernel oil, palm oil is made in the orient only. In the case of peanut oil, the peanuts after being shelled, blanched and degermed, are given a preliminary pressing in an expeller press and the oil obtained is a virgin oil, i.e., an oil capable of being used for edible purposes without any subsequent treatment. The cake from the expeller press is then ground, cooked and put through an hydraulic press to obtain the remaining oil in the original peanuts.

Most vegetable oils are shipped in their crude form from the many places where they are produced to some central point where they are refined into a more finished product. When these vegetable oils arrive at this central point, which is the oil-refinery, they are graded according to acid and also color and flavor of refined product. Usually, these characteristics go up and down together, i.e., a high acid crude oil will give a dark colored off flavored refined oil. Hence, the first and easiest step is to run an acid test upon the oil and from that obtain an indication of what the finished quality of the oil will be and of what treatment the oil needs. After a decision has been reached, the next step is to treat the oil on a laboratory scale in just the same manner as the oil is to be treated in the plant. If the first treatment does not give the desired results, another test is run with the treatment varied and so on until one has definitely determined just how to handle the oil in the plant. This sounds like a rather slow method but as a matter of fact, the refiner can determine almost at once from past experience just what course to follow and usually one or two tests are sufficient.

Methods of Refining.

In the refining of oils, the method almost universally employed is to agitate the oil with a solution of caustic soda, allow the resulting soap to settle and syphon off the supernatant oil. This procedure neutralizes the acid in the oil, coagulates the albuminous material, and, in settling, drags down what meal or other foreign matter there may be in the oil and leaves an oil comparatively pure and neutral. A certain amount of the original color in the oil is also removed at the same time. This neutralized oil, after being syphoned off, is clarified by further settling, and is then mixed with some bleaching reagent such as fuller's earth or filt-char, and pumped through a filter

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press which removes the bleaching reagent and leaves the oil clear and relatively colorless. The oil is then run into a deodorizer and blown with steam at a high temperature, which action removes the disagreeable odors and flavors and renders the oil palatable. Certain oils, on account of their mild flavor, are suitable for what is termed salad oils. They have to be further processed after the deodorizing to remove the stearine or portion of the oil which solidifies at the lower temperatures. The first step in this process is to artificially chill the oil with refrigeration, which crystallizes out the stearine. The mixture of stearine and oil is then put through a filter press, which allows the oil to run through and retains the stearine. This gives an oil liquid at fairly low temperatures and capable of making a smooth salad dressing. This salad oil is also bought by the orthodox Jews for ordinary cooking purposes, because they are always suspicious of an oil which hardens, thinking that if it hardens it contains animal fats.

There are some patented modifications of the alkali treatment which are used by some refiners upon payment of a royalty. One is the Chisholm process, in which silicate of soda is added to the caustic soda. It is claimed for this process that the silicate of soda consolidates the foots resulting from the refining and reduces the amount of shrinking due to oil being entrained and carried down with the soap. As against this, refiners who have used the process say that the resulting oil is not as light in color as when silicate is not used.

Another modification of the caustic soda method is the Baskerville process. In this process, a percentage of some form of cellulose, such as cotton linters, is added to the oil along with the caustic soda, and then later a percentage of soda ash is added and the whole mixture pumped through a filter press to separate the oil from the foots. They claim for the process a saving in shrinkage and a saving in time required for completing the operation. With the ordinary process of alkali treatment, the foots is slimy in nature, so that it would be impossible to separate it from the oil by filtering and so it is separated by settling, which takes at least twelve hours. The Baskerville process is claimed to produce foots of such a character that they can be separated from the oil immediately by filtering. Hence, an oil refinery with a given equipment could put through twice as much oil with one process as with the other. One of the objections to the process is the disposition of the cellulose in the foots. There is also a slightly increased cost in chemicals used over the old method.

The matter of shrinkage is a very important one to a refiner. An average shrinkage for a season, year in and year out, is nine per cent. This is way and above the theoretical shrinkage, and one can readily see that where a refiner is handling millions of pounds of a product, a very small saving in shrinkage runs into money fast.

Foots.

The settlings from the refining of the oil by the addition of the caustic soda are called "foots." Foots consist of neutralized fatty acids, coagulated albuminous matter, dirt and other such impurities, precipitated coloring matter, saponified oil, and unsaponified oil entrained in the foots. Formerly, foots were either pumped to a tank car and shipped to the soap maker or cut with sulphuric acid and the resulting fatty acids or "black grease" sold to the soap maker. But recently the Sharples Specialty Co. have perfected a process whereby these foots are diluted with water and this diluted foots run through their supercentrifuge separators and a certain proportion of the unsaponified oil which is entrained in the foots is recovered. The diluted foots that passes through the Sharples machines, after the free oil has been removed, is cut with sulphuric acid and made into black grease. This process is one of the most important improvements to the old method of refining that has been developed in recent years.

Hydrogenation of Oils.

Another development in the oil and fat industry in recent years is the hydrogenation of oils. Briefly, the process consists of blowing hydrogen through the hot oil in the presence of some catalyzing agents such as nickel. The hydrogen combines with the oil and changes it into the harder forms of fat. This invention has had a wonderful effect upon the oil and fat industry. For one thing, it has made the soap manufacturer independent of the supply of harder fats, as he can buy softer oil and harden according to his needs. Furthermore, certain oils and fats which could only formerly be used for inedible purposes on account of disagreeable flavors which could not be otherwise removed, are so improved by hydrogenation that they are being now used for edible purposes.

There are a few uses for vegetable oils, which are so well known that it is hardly necessary to enumerate them, such as for the manufacture of paints, soaps, candles, lubricants, shortenings and oleomargarines. However, there are other uses of vegetable oils which are not so well known. For instance, rape-seed oil is used for the preparation of sanctuary oil, which is burned in Catholic churches instead of wax tapers. It burns at all temperatures and with a smokeless flame. Palm oil is used for coating sheet iron before it is galvanized. Cocoanut oil is used in the filling of chocolates. The soot from the burning of sesame oil is used in the manufacture of India inks. Vegetable oils are also used in insecticide sprays, perfumery salves, ointments, liniments, suppositories, artificial milk and cream, ice-cream, linoleums, putty, fly-paper, and rubber substitutes. In the packing house industry vegetable oils are used for the manufacture of shortenings, oleomargarines, and nutmargarines. In the case of shortening, the process consists of melting together a mixture of an oil such as cotton oil and a harder fat such as oleo stearine and running this mixture in a melted condition upon a revolving hollow cylinder, through which is pumped chilled brine. The cold cylinder, or roll, as it is called, chills the mixture instantly, and after it is chilled this mixture is automatically scraped off the roll, dropped into a trough, mixed into a homogeneous mass and pumped to the packages in which it is to be shipped. The proportion of oleostearine or similar hard fats in the mixture depends upon the season of the year and the locality to which the shortening is to be shipped.

Oleomargarine.

Oleomargarines and nutmargarines are made by melting a suitable mixture of oils and fats, milk or butter and chilling this mixture by spraying in cold water. The chilled or crystallized fat is placed in trucks and held at a suitable temperature until it has ripened, i.e., taken on a butter flavor. It is then put through a butter worker where the necessary amount of salt is added and the surplus water removed. The oleomargarine is then formed into prints and packed. Nutmargarines are made in a similar manner, the difference in the two being the formula and the color. Nutmargarines contain no animal fat and are white in color. Oleomargarines contain a certain per-

centage of oleo oil and are made as close to the color of butter as possible, without, of course, the use of butter colors.

The scarcity of fats during the war compelled manufacturers to seek new sources of raw material for their purposes, and in many cases they had to seek what had formerly been considered inferior raw material. This led to inprovements in the technique of refining oils with the result that new uses were found for these oils, and the demand for them stimulated. An illustration of this is shown in the increased importations into North America of copra and cocoanut oils. In 1907 there were imported into North America, 7,064,532 lbs. of copra and 35,544,356 lbs. of cocoanut oil, while in 1918 the importations were 486,996,112 lbs., and 259,194,853 lbs. respectively, thirteen times as much. To show the magnitude of the cocoanut oil industry, one concern alone in Java is capitalized at $16,000,000.00.

Tho vegetable oil business offers immense opportunities for research and improvements in methods. There is a scarcity of definite knowledge concerning what happens in some of the operations in the refining of oils. Just why is it that Fuller's earth takes the color out of oil and why does caustic soda take out some color, too, when it neutralizes the acid in the oil? What are the disagreeable flavors and odors in oils? Is there not some other better method of neutralizing acid which will not carry with it so much of a loss of unsaponified oil. Perhaps if we find out what is actually happening we can devise a better method. We very often receive an oil upon which, in spite of the greatest care in handling, we cannot obtain concordant results either in the laboratory or factory. It always seems as if there was some factor over which we had no control except by chance.

METRIC SYSTEM BILL INTRODUCED IN UNITED STATES SENATE.

Introduced in the Senate by Hon. S. T. Frelinghusen of New Jersey and in the House of Representatives by Hon. Fred. A. Britten of Illinois, the Metric Standards Bill is now before the governing bodies of the United States. Provision is made for a gradual advance to the decimal metric units of weights and measures during a transition period of ten years. Ten years after the passage of the bill the weights and measures of the metric system would be the single standard for the sale of goods and for computing transportation charges and wages. After the first two years following enactment of the bill all foods in package form which are required to be marked in terms of weight or measure must use the metric system, though from the second to the tenth year the customary units may be retained in addition to the metric, if desired. Manufacturing concerns may continue using present types of machines for producing goods, but the product will have to be listed, bought and sold on the metric system. After four years weighing and measuring devices shall be manufactured in accordance with the metric system.

Press despatches from New York bring the news for which builders have been waiting for months, namely, that the U.S. Steel Corporation has announced substantial reductions in the price of steel. The reduction on tin plates brings their price from $140 a ton to $125 a ton. Steel rails are not included in the reductions.

AN INDUCTANCE COIL FOR USE IN PREPARING COLLOIDAL SUSPENSION OF METALS BY THE BREDIG METHOD.

In the preparation of Colloidal Metallic Suspensoids by the Bredig arc-dispersion method, it was found almost impossible to maintain the arc for longer than the fraction of a second. This made the preparation long and tedious, and resulted in considerable coarse material being thrown down at the expense of the metal in question. In short it did not yield good solutions with a minimum of wastage on the metal being dispersed.

The presence of the very small concentration of electrolyte required to peptize the metal as in the case of a gold hydrosol is without effect on the arc.

A useful piece of apparatus in the form of an "inductance" coil for stablilizing the arc may be simply and cheaply made up as follows:

Twenty-four pieces of soft iron wire about 2 mm. diam. and 18" long are bound into a bundle tightly with electric tape to serve as a core. On this is wound 150 ft. of ordinary copper bell wire (waxed cotton insulation), in three concentric coils, of 50 ft. each, the layers being separated by tape. The terminals are so arranged that one, two or three of the coils may be used, in parallel, as desired. The whole is taped over and mounted on a wooden stand, into which binding posts may be screwed. The ends of the core which should project ¼" from the tape are connected by a piece of stouter copper wire than that used for the coil.

I have found that by connecting this apparatus in series with a Bredig arcing stand and a resistance sufficient to give, when arcing, a current of 3 to 4 amps. on the 110 volt D.C. Circuit, a continuous arc may be produced for periods up to four or five minutes, whereas without it, such a condition is impossible. The metal is dispersed with great uniformity in size of particles and a minimum of coarse particles which settle out. The cost of the entire coil with all fittings was less than $2.50.

A. F. GRANT CADENHEAD, F.C.I.C.

Department of Chemistry, Queen's University, Kingston, Ont., March, 1921.

LEADER IN FERTILIZER INDUSTRY IN UNITED STATES DIES.

Daniel Baugh, Philadelphia, Pa., president of Baugh & Sons, Company, fertilizer manufacturers, died suddenly of heart disease at Palm Beach, Florida, in his 84th year. The Baugh Company was one of the oldest established fertilizer industries in the United States. The firm was formed in 1855, with the father, John P. Baugh, and his two sons, Edwin and Daniel. Upon the death of the father in 1881 the sons continued the business and after the death of Edwin Baugh in 1888, Daniel Baugh became the active head of the firm and its subsidiary companies, which include the Baugh Chemical Co. of Baltimore and the Delaware River Chemical Works. Although always a busy man, he found time during his long career to perform many notable services for the betterment of his fellow men. He was a trustee of the Jefferson Medical College and Hospital, Philadelphia, having personally equipped the anatomical department of this college at a cost of nearly $200,000. In religion he was an Episcopalian, a member of the Masonic order and of several clubs.

The Chemical Engineer and the Sulphite Division of the Newsprint Industry*

More Economic Production Made Possible by Application of Relatively Simple Principles of Chemical Engineering

By R. W. McKENZIE†

THE cooking acid for sulphite pulp is sulphurous acid and calcium bi-sulphite, the total SO_2 in the acid should run about 5.25%, the free SO_2 about 4.15% and the combined about 1.10%. The raw materials used in the making of the acid are sulphur, oxygen as air, limerock and water. It is essential that the analyses of the raw materials should be known. The purchasing department needs to be kept advised of the quality of materials received and if the chemical engineer knows his raw materials, he will the better be able to control the irregularities of operation and, knowing that the quality of the materials has not changed, it is impossible to blame faulty work on them. In making SO_2 gas, the sulphur is first melted in a steam jacketed vat and the liquid is run through pipes to the burners, where it is burned and changed to a gas. This gas is drawn into a combustion chamber, which has an air inlet, and the sulphur and the oxygen of the air unite to form sulphur dioxide. There are certain variables that must be brought under control if all the sulphur gas is to unite with the oxygen and in the proper proportions, and these are the temperature of the gases in the combustion chamber and the volume of the air passing into the chamber. The operators were experiencing such troubles as the sulphur subliming in the coolers and necessitating cleaning at least once a week and sometimes more often. It was also found that sulphuric acid was being formed in the coolers and this was evidence that sulphur trioxide was being formed somewhere in the system rather than SO_2. One operator had a black stick stuck in the pipe leading to the fan and when he noticed that it was becoming coated with sulphur he would go to the burner room and adjust the air inlet while it was more than likely that it was the temperature of the combustion gases that was wrong.

Controlling Gas System.

The following is a record of valuable results obtained by simple applications of chemical principles. On investigation the chemical staff found that the pipe line running from the combustion chamber to the coolers was not air-tight and as there was suction there was oxygen being drawn into the pipes. The whole piping was inspected very thoroughly and all leaks closed so that the air was only being admitted at the proper place, i.e., at the combustion chamber. As sulphur gas and oxygen unite efficiently at about 500 degrees Centigrade, a recording pyrometer was connected with the combustion chamber. In this manner the operator had a close tab on his temperature at all times, and the technical department a record that was valuable in co-ordinating the operations in the acid plant. Gas tests were instituted and the operators were informed every hour of the peprcentage of SO_2. With all this data, the operators were able to practically eliminate the sublimation of sulphur in the coolers and the formation of sulphur trioxide. Before these factors were tied-in, it was taking 250 lbs. of sulphur to make a ton of pulp, and the control of these variables reduced the sulphur to 220 lbs. per ton of pulp. This was a great improvement and the saving made was not in sulphur per ton alone, but it made possible a better cooking acid and therefore more yield of pulp per cord of wood.

The Manufacture of Acid.

Two vertical towers are filled with limerock and are connected in series. The solution and the gases travel counter-current through these towers. The gas is blown by a fan into the bottom of the so-called strong acid tower and is partially absorbed by the weak acid which trickles down through the limerock from the top of the tower. The excess gas from the strong tower enters the bottom of the second or weak acid tower and is absorbed by the water which enters at the top of the tower and passes down through the limerock. The resulting weak acid is pumped to the top of the strong tower. In the towers the lime required is taken from the rock. From the strong tower the acid is pumped to the top of a tower filled with blocks. The relief gases from the digesters enter at the bottom of this tower and are absorbed by the strong acid. From the recovery tower the acid flows to storage tanks from which it is pumped to digesters as needed. Sulphur dioxide gas is more soluble in cold water than in warm water, therefore it is necessary that the temperature of the water going into the weak tower and also the gas entering the strong tower should be under control. Recorders were installed on these. The gas going into the towers from the coolers contains about 16% SO_2, in a well-run acid plant, and it is necessary that this dioxide be all absorbed and none of it lost into the air through the opening in the top of the weak tower. A double check on the absorption was obtained by analyzing the gas leaving the weak tower. By controlling temperatures and having gas analyses, the sulphur consumption was again lowered. The relief gases from the digesters were not being efficiently absorbed in the recovery tower and the operators had run a pipe line from the top of this tower to the pressure side of the fan. As the fan provided draft for the burners, the relief gas pressure was "bucking" the fan to the detriment of the burners. When this change did not work satisfactorily the pipe line was changed over to the suction side of the fan. They were trying to keep the gases in the system and they were putting relief gas into the strong and weak towers instead of the burner gas. The difficulty, as found by the chemical department, was that the relief gases were coming to the recovery tower without being properly cooled. The strong acid in the tower was being heated by these gases and would not hold the gas. By cooling the hot relief gases more efficiently this difficulty was overcome and the strength of the cooking acid built up. The operators had been running their own acid tests but on investigation it was found that the results were not correct and the true conditions

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not shown as they should have been. The acid-maker's report would not show any variation for a whole shift while the other conditions in the plant had been very erratic. The superintendent had given orders for a certain strength acid and the operator was seeing that he got it on paper anyway. Regarding the actual tests they were using tenth normal solutions of iodine and sodium hydroxide to get the total SO_2 and free SO_2 respectively, and after getting the end-point it was necessary to read the burette and then consult a table to ascertain the percentages. Sixteenth normal solutions were provided and with these the percentages were read right off the burette, but even then it was impossible to get the acid-makers to put down what they were finding as they were not sure of their results. The technical department had to take over the testing. This at first made the operators antagonistic and the superintendent questioned our results as we were getting percentages that differed with his in the plant. He would not use distilled water as we were using and on testing with us in the laboratory he could not get the same results twice in succession so he began to appreciate that the technical man could give him accurate acid tests when he obtained the same readings in two or three trials. The superintendent really wanted the actual figures and after seeing it done correctly he did not feel that he wanted to get doubtful percentages on his acid. These changes in the acid plant had a very important bearing on the production of the sulphite mill as not only was the amount of raw materials used per ton of pulp reduced, but the production was increased and the product was more uniform, and this latter brought an improvement right through the mill. When any of these changes were being made the operators were given all the information that they desired, and when they were shown how valuable all the data was to them they became better acid-makers. When the plant was put in shape so that the operators were able to get real progress, graphs were put up in the acid plant. These graphs brought home to the operators in the quickest manner how all the variables when co-ordinated and controlled meant progress. Similar graphs were kept in the laboratory, and by studying it each day any trouble was located, and from the data on the graphs it was possible to find the cause, and the operators would be shown where they were going astray.

Putting Wood Room on Scientific Basis.

The variables in the wood room are size of chips, dirt and moisture content. A chip ⅝ inch long is the most desirable. Samples of chips were screened in the laboratory over a period of several weeks, and the percentage of good chips were found to vary from 50 to 70. These results were taken to the wood-room operators, and chipping knives, screens and crusher were adjusted until the percentage of good chips was brought up to 85 and 90. The dirt comes from rotten wood and bark mostly. Samples of chips were analyzed for dirt in the laboratory, and by using greater care, in barking and culling, the dirt was reduced. Graphs of size and dirt were put up in the wood room and their meaning explained in detail to the operators, and when they saw how they functioned as an important unit in the general progress in the mill they kept their graphs running in a straight line. The moisture-content in the wood or chips was found in the laboratory, and these results went to the operators in the acid plant and in the digester house. When the moisture-content changed it was necessary to change either the acid or the cooking conditions in order that the quality and the quantity of production be kept uniform.

The Digester House.

The real results of improving conditions in the acid plant and the wood room were made evident in the cooking of the wood in the digesters. If the acid is not up to the required strength, and if the chips run large, the resulting pulp will contain much uncooked wood. In order that the operators in the digester house can get uniform results it is essential that they have uniform materials. In cooking, the digester is filled with chips, then the chips are covered with acid. The digester is closed and steam is turned on. The temperature and pressure rise. At 70 pounds pressure they start relieving so as to keep pressure constant and be able to raise the temperature. Even with uniform chips and acid the steam consumption per ton was varying, so steam flow meters were installed on the steam line to each digester, and it was made possible for the operator to use his steam uniformly. Before technical control was instituted the production of the sulphite mill was variable, it being sometimes necessary to retard the paper machines as the sulphite was not fit for use. Pitch would accumulate on the wires and felts, the sulphur and steam used per ton of pulp was too high. Through the investigations made and by co-ordinating the findings, and by giving the operators guides to aid them and removing much of the "rule of thumb" methods, real progress was made, and the saving all along the line, while hard to compute in actual dollars, was enormous, and an example might be made of one large saving, i.e., in not having any of the paper machines down waiting for stock.

Washing and Screening.

The stock from the digester is blown into a tank with a double bottom. The perforated bottom is a few feet from the solid bottom of the tank and allows the liquors and wash-water to drain away from the stock. Several times water is allowed to drain through the stock in the blow-pit so as to take away as much of the spent liquors as possible. Then the stock is pumped from the blow-pits into an agitator, where the stock consistency is equalized. From here the stock goes to knotters, where the knots and uncooked wood are taken out and sent to refiners. The good stock from the knotters goes to a riffler, where the stock is thinned and passes over a series of baffles which break up the lumps, making the stock uniform for the screens. From the rifflers the stock passes to the screens. The good stock from the screens goes either to thickeners and then to the mixing room, or to the wet machines to be made into lap. The rejects from the screens go to refiners, and the refined stock from here goes back into the system at the rifflers preferably. At first it was entirely up to the operators as to the different consistencies, and these varied considerably, with the result that there were many overflows and quite a quantity of sulphite was being lost every day. The screen water or white water was supposed to be used over and over, but the operators would use fresh water and let the white water go to the sewer. The variation in the consistencies was overcome by regulating the white water and fresh water valves, and by not allowing every man in the screen room to change the valves. The main thing in the screening was to have the cooked pulp uniform, and then the thinning out of the stock could be better regulated. From the work done in the acid plant and the wood room the stock became more

uniform, the rejects at the knotters were decreased, the tailings from the screens were lessened and the waste eliminated.

Present and Future Problems.

The sulphur used in the majority of our acid plants comes from the United States, and for every ton of sulphite pulp made there is used at least 200 pounds of sulphur. At the present time the American sulphur is the cheapest and the purest, but there is plenty of sulphur in this country, and it is a problem to devise a method that will make it possible to utilize it and at a price comparable with the price of imported sulphur. A cord of prepared wood weighs about 4,500 pounds and contains an average of 40% water, leaving about 2,700 pounds. This one cord of prepared wood yields about 1,000 pounds of sulphite pulp. The other 1,700 pounds is not used commercially as yet. It is mainly composed of the pitches and resins of the wood. This loss provides a very good problem, as the liquors which contain these pitches and resins are being turned into the rivers and lakes and contaminating them. In the future these waste products will be used, and it is quite likely that the manufacture of sulphite pulp will become the secondary consideration, and that the separating out of these organic compounds and marketing them will pay better than the pulp. When the contents of the digester is blown into the tanks, for draining and washing, gases are given off to the air. These gases and the wash liquors contain the 200 pounds of sulphur that is lost with each ton of pulp made. At one time it required 400 pounds or more of sulphur to get a ton of sulphite, but by recovering the gases given off during the cooking processes it has been reduced, under good opration, to 200 pounds. Without th utilization of the waste liquors a large percentage of the sulphur will be recovered, and this one saving will amount to a large item in itself. There is no doubt but that, when the waste liquors are being reclaimed in a commercial way, the cooking will be materially changed and the sulphite pulp will be more uniform, and many of the operating difficulties will be eliminated. In the designing of new mills the chemical engineer is going to be consulted, and the practical man is not going to be in the position where, if it is not designed like the mill in which he worked, it has got to be changed. This does not mean that the operator will not function in the layout, but the organization will be lacking if the executives ant the practical men do not have the chemical engineer to co-operate with them.

OIL-BEARING SEEDS

THE number of plants which bear oily seeds is very large. Some of the most important of these such as the oil palm, Brazil nut, peanut, etc., cannot be cultivated in Canada. Among those which have been tried in this country or which are worthy of trial are flax, hemp, soy bean, sunflower, castor bean, opium poppy, and rape.

It is unnecessary to say anything about flax which furnishes the valuable linseed oil so extensively used in the manufacture of paints, varnishes, linoleum, etc.

Hemp has ripened seeds each year for several years past at the Central Experimental Farm at Ottawa. Hemp seed oil, though not equal in this respect to linseed oil, has good drying properties and is used for paints and varnishes, soft soaps, and for edible purposes.

Four varieties of soy bean obtained from different parts of the world have ripened seeds satisfactorily at Ottawa for several successive years. The oil content averaged a little over 20 per cent. The oil is extensively used in China and Japan for edible purposes and the cake forms a valuable cattle food. In this country the oil is used mainly for soap-making. It has considerable drying properties and is also used to some extent for making paints.

Russian sunflowers have been cultivated with success at Ottawa. They are valuable honey plants and the dried stems can be used for fuel. Some specimens reached a height of 10 feet with heads 15 inches in diameter. The kernels may contain as much as 50 per cent. of oil. The oil has a pleasant taste and is used to some extent for edible purposes, for making soap, and to some extent for varnishes.

The castor oil plant is grown mainly in warm or tropical countries, but ripe seeds have been obtained each year from a number of varieties grown at Ottawa. The worst feature about this plant is that each seed-capsule bursts when ripe and scatters the seeds to some distance around, thus necessitating frequent collection of the seeds by hand. A variety was grown last year which does not appear to have this objectionable feature and will be further experimented with. An analysis of the whole seed, made by the Dominion Chemist, showed from 39 to 47 per cent. of oil present. Castor oil has very extensive uses, being employed for medicinal purposes, dressing leather, lubrication of machinery, soap-making, ointments, dyeing, and insulating material for electric cables.

Opium poppy has grown satisfactorily at the Experimental Farm. The oil is edible and is also used for fine artist's paints.

Rape would probably grow in Canada but I have not experimented with it. It yields Colza oil which, owing to its viscosity, ranks high as a lubricant. It is also used as an edible oil, for burning and other purposes.

J. ADAMS, Botanist.

Dominion Experimental Farm, Ottawa, Canada.

OIL DEVELOPMENTS IN WESTERN CANADA.

The Imperial Oil Company and the Edmonton Gas & Power Company, are seeking powers from the Alberta Provincial Legislature to enable them to construct pipe-lines through the Province, for the purpose of conveying oil and gas respectively. No route is specified and wide powers are being sought.

Since the commencement of the year 19 oil and gas claims, covering more than 6,000 acres have been filed with the recording agent at Fort Smith. Practically the entire area in the vicinity of Pine Point, on Great Slave Lake, has been covered. The claims have been staked by parties that have "mushed in" over the winter snow from Edmonton and other northern points. All the claims were staked under the old laws; it is supposed that they will have to be adjusted to the new rulings.

CHANGE OF ADDRESS.

Our readers, and others interested, will please note the change in address of the offices of this journal, from Manning Chambers, 72 Queen Street West to Hamilton Trust Building, 57 Queen Street West, Toronto. All communications should be sent to this new address. Any of our readers who at any time may be paying a visit to Toronto will be welcomed at our offices. Come in and have a chat with us regarding the journal, and undoubtedly your views and suggestions will be helpful to us in our endeavor to constantly improve it.

CANADIAN CHEMISTRY AND METALLURGY,
57 Queen Street West, Toronto, Ont.

A Classification of Pigments*

With a Descriptive Outline of the Manufacture of Some Dry Colors

By G. C. McEWEN†

THE manufacture of colors is one of the oldest branches of industry of which we have documentary evidence. Even to-day there are evidences of prehistoric men having used colors in decorations, as in Egyptian wall paintings, which represent human beings clad in colored garments. The pigments used have remained throughout the ages, and in some instances it is said they are in as good a state of preservation as when applied. Besides some knowledge of the use of natural and artificial pigments the ancients also understood to some degree the process of dyeing. The earliest records reveal that the Egyptians, the Chinese, Greeks and Phoenicians were the pioneers in this line of endeavor.

There has been, however, more advancement in the color manufacture in the last half century than in all that of previous history. Hundreds of organic lakes and pigments are to-day available as the result of scientific investigation made possible by the introduction of chemists focussing all their genius on the one study of color research.

Everyone present, no doubt, has heard of crude coal tar. It is the black tarry liquid which runs out of soft coal on being subjected to dry distillation. It is from this crude material that practically all our organic coloring products are derived. Fractional distillation of this complex product gives the basal constituents mostly used, such as benzol, toluol, zylol, naphthalene, phenol and anthracene. The initial work and primary development of the distillation of coal tar is one of the greatest triumphs of modern chemistry, and the honor goes to Perkins, an Englishman, who about the year 1856 discovered its possibilities. Perkins discovered the means of making a few colors, but some years afterwards the German chemists, having obtained the idea from more fertile brains than their own, have made remarkable progress in the coal-tar industry. Before the war they had practically a monopoly of the manufacture and sale of all organic colors, intermediates, etc., but owing to the cutting off of the German supplies many countries, such as Great Britain, United States, France, Switzerland and Japan, have developed large works, and it is a question whether Germany will ever enjoy such a monopoly again.

To get at a scientific way of studying pigments it is preferable to divide all colors into two classes: (A) **The Natural Colors** (both of inorganic and organic origin), and (B) **Artificial Colors.**

(A) NATURAL COLORS.

Natural colors, as the name implies, are found in a natural condition, and under this heading of inorganic pigments we have the following divisions:

1. Whites.

(a) Barytes (natural barium sulphate).

(b) Whiting (calcium carbonate).

(c) Gypsum (calcium sulphate).

(d) Witherite (barium carbonate).

(e) Talc and Asbestine Pulp (talc, a magnesium silicate; and asbestine pulp, a double silicate of magnesium and calcium).

(f) Silax (silicon dioxide).

(g) China Clay (aluminum silicate).

2. Yellow Earth Colors.

(a) **Ochres.**—Ochres vary greatly in shade and composition. They are essentially a clay, tinted naturally with iron compounds. They vary in shade from a pure yellow to a dull orange down to a red ochre. Some of the best ochres come from France, and are marked by letters such as J.F., J.F.L.S., etc., each letter standing for some French word. For instance, J stands for "Jaune," meaning yellow; F for "Fonce," meaning deep; L for "Lave," designating that it has been washed, and S for "Surfin," meaning "superfine"; thus a J.F.L.S. ochre would mean a superior, deep, yellow-washed ochre. A good average ochre contains about 19% sesqui-oxide of iron, which gives the yellow coloring matter, and the remainder is silica and alumina oxide.

(b) **Siennas** (raw and burnt).—They have practically the same composition as an ochre but are stronger, owing to the greater proportion of sesqui-oxide of iron, some good Italian samples running as high as 70%.

3. Red Earth Colors.

Under this head come practically all of our oxides of iron, as Venetian red, Indian red, Canadian red, Italian red, brown oxide, crimson oxide and Spanish oxide. The lowest oxide in content of iron being Venetian, which runs from 30% to 33% sesqui-oxide, the remainder being principally calcium sulphate, and in cases of some other oxides, alumina silicate. Canadian red is perhaps the highest oxide, containing up to 98% sesqui-oxide of iron.

4. Brown Earth Colors.

(a) **Umber** (raw and burnt).—Umbers are less in content of iron than siennas, but have manganese dioxide present, which accounts for the different tones and shades. An average umber would contain from 7% to 14% of this oxide.

5. Black Earth Colors.

(a) Graphite (an allotropic form of carbon).

(b) Black magnetic oxide of iron.

Natural colors of organic origin may be divided into two groups:

(1) Natural coloring matter of animal origin.

(2) Natural coloring matter of vegetable origin.

Under the heading of natural coloring matter of animal origin the best representative is carmine.

The very small insect coccus cacti lives in southern countries and thrives on the leaves of certain plants. The females of this insect are collected shortly before the laying season and are killed either by steam or hot water, then dried and sold under the name of cochineal, which is the raw material of carmine. It takes about 65,000 of them to make a pound. The methods of extracting the coloring matter are numerous, and the best are kept secret. However, there are some general principles well known that hot water solutions of cochineal throw out a red

*Paper delivered before Paint and Varnish Club of Toronto, January 13th 1921

†Works Manager, Imperial Varnish & Color Co., Limited, Toronto.

deposit by addition of weak solutions of certain acids and saline materials.

Besides carmine, there are others not as well known, as lac-dye, Indian yellow, sepia, and purple snail.

2. **Natural Coloring Matter of Vegetable Origin.** The following vegetable dyes are the chief ones: Logwood, dragons blood, fustic, Persian berries, gamboge wood, litmus, turmeric. Probably of all these, indigo is of most interest. As a blue, it is very permanent, but even this natural color has been almost entirely replaced by the discovery of the artificial synthetic indigo derived from coal tar.

(B) ARTIFICIAL COLORS.

Artificial colors are divided into two groups.

(1) Organic colors.

(2) Inorganic colors.

Organic colors may be classified roughly as follows:

(a) **Acid Colors**—They are precipitated by either barium chloride or calcium chloride.

(b) **Basic Colors**—These are precipitated by addition of tartar emetic and tannic acid. Some are also precipitated by the use of arsenic salts.

(c) **Dyes precipitated by the addition of lead salts**, as eosin, rose bengal, etc.

(d) **The Diazo Colors**, such as paranitraniline reds, toluidine red, lithol reds, etc.

(e) **Mordant Colors.**

The second division of the artificial colors.—The inorganic colors are principally chrome yellows, chrome greens and iron blues.

I will only have time to treat of some of the colors made by the wet process, omitting those manufactured by the calcining treatment. To be successful in making a good line of dry colors it is essential to have your raw materials well standardized and have accurate control during the entire process.

Chrome Yellows.

Chrome yellows are prepared by the precipitation of water soluble lead salts by the addition of soda bichromate. The manufacture and control of these chrome yellows is not an easy matter, as I have often heard people state. It is true a collegiate school boy is able to precipitate a lead chromate which to all appearances seems to be a bright yellow, but if the same reactions were made in a commercial way the color would be useless.

Chrome yellows embracing those from a light primrose to a deep orange are perhaps at once as wonderful a pigment as they are useful. There are very few, if any, pigments, varying as little in chemical composition, which present so broad a range.

Lemon yellows, or in other words, all lighter chromes than the medium shade, are made by precipitating lead sulphate a white opaque pigment with the yellow chromate of lead. This is done by either precipitating out some of the soluble lead salt by the addition of sulphuric acid or any soluble sulphate, or adding them to the solution of bichromate of soda.

It makes little difference as to the nature of the lead sulphate precipitated whether sulphuric acid or a soluble sulphate, such as soda sulphate (Glauber's salts) is used, but you actually obtain different results in the finished yellow, owing to the compound set free by the reaction. Lead sulphate could probably be added as a separate pigment much cheaper than by precipitation, but the resultant color would be only a muddy and lifeless medium shade compared with the other method or in other words would be a bleached out medium chrome yellow. It is therefore absolutely necessary to have lead sulphate simultaneously precipitated with lead chromate to obtain a light shade. The precipitating of this sulphate has a tendency to act as a "Stopper" on the color deepening down, caused by larger particle formation. It is advisable in light chromes to work to acid reaction, the opposite being the case where orange shades are required.

Medium chrome yellow is the normal lead chromate and when freshly prepared in the tank is rather lighter in appearance, but owing to the fact that there is little, if any, lead sulphate present, the color very soon darkens down to a medium shade. It has a tendency to become more crystalline than the light chromes.

Orange chrome yellows are usually made from litharge and acetic acid and the lead acetate is made very alkaline by the addition of as much litharge as the acetic acid will take up. If analyzed they actually contain less chromate of lead than the medium shade and there is always a proportion of oxide of lead present. They are the most crystalline of all the yellows, and it has been noticed that in fine grinding in oil between stones the color will lose its brightness owing to the crystals breaking down.

There has always been a great deal of discussion as to which yellow is the better, lead nitrate or lead acetate. It is common knowledge that there is a great deal more of the latter being manufactured and sold than the former. Primrose yellows are usually made with lead nitrate, as they are inclined to be paler and greener, but medium yellows can be made as good by the lead acetate as lead nitrate method and if carefully prepared with no idea of making them cheap will stand as well to the weather. There is a difference in oil absorption, lead nitrate yellows having lower oil absorption and are not as "fluffy" as lead acetate chromes.

Iron Blues.

Iron blues are made by adding a solution of prussiate of soda to a solution of an iron salt, usually iron sulphate (copperas). They have a very complex construction and I could not definitely set down in chemical notation its exact formula. The ordinary formula in most text-books for an iron blue is not correct, as it shows neither sodium nor potassium, as the case may be, in its construction. It is common knowledge that if a blue is made from a potassium salt there is a trace of potash left in the blue, and if from sodium, a small percentage of that metal is present. These cannot be washed out, but are part of its construction. Before the war there was very little prussiate of soda used in comparison with potash for blues or greens manufactured, as up to that time it was impossible to get as bright a shade, and beside, the yield was less owing to more water of crystallization present in the former. However, by the addition of certain chemicals to the prussiate of soda before precipitation with the iron sulphate, it has been possible to make as good blues or greens as by the potash method.

There are five main blues made by combining prussiate of soda with iron sulphate. These are: Prussian, milori, bronze, Chinese, soluble blue.

Prussian Blue has a very dark top tone with a purple undertone, letting down with zinc oxide to a light mauve tone.

Milori Blue has a much lighter top tone than Prussian, and a bluer, brighter undertone. It is inclined to be rather

red in appearance, but should not have a high bronze lustre.

Chinese Blue comes in between a milori and bronze, and has a clear, celestial blue undertone, and is probably the best blue to use in striking a lead chromate on to make the brightest greens.

Bronze Blue is used in large quantities by the printing ink trade but seldom, if ever, by paint manufacturers. Its fracture in the dry lump before being ground is quite bronzy, and when printed out has a metallic lustre.

It should be remembered that there is no universally adopted standard for any of the above blues, and what one user might decide was a bronze blue another might call it a milori blue. The study of this one pigment would give enough work to a color chemist for years before he would be able to control its manufacture and work out all the variations possible due to degree of concentration or dilution of solutions, rate of stirring, temperature, etc.

Chrome Greens.

Chrome greens are made by precipitating a chrome yellow on a blue. The more blue present the deeper the green and vice versa. Lead nitrate greens are bluish in undertone, while lead acetate are yellowish. The latter are somewhat cheaper to make, as you can get more yellow in to the same amount of blue and yet not be lighter in shade than a lead nitrate green. In other words, a lead acetate yellow is stronger toward whites and weaker toward blues than a lead nitrate yellow.

Reds.

The whole evening might be devoted to this important branch of dry colors, but we will only have time to discuss one or two of the important diazo colors.

The two most important diazo colors in the paint trade are the paranitraniline and the toluidine reds. Para reds are made by adding diazotized paranitraniline to beta napthol, which has been put into solution by the addition of an alkali. They are made in two distinct shades—light and deep; and by blending any shade between may be obtained. Para reds are a good serviceable color on wood and are quite permanent, but do not stand well on any metal when the weather is warm, as they sublime. They are somewhat soluble in oil, as evidenced when one stripes white over a red background. The "bleeding through," as it is called, is not probably due so much to oil solubility as to the color subliming. For instance, if a board was painted with a para red, then cut in two, and a stripe of white painted over each, one of them being exposed to the sun in warm weather, you would find the red would come through the white very much quicker than the one left inside. The same thing happens inside but more slowly, as with heat sublimation takes place more quickly.

Toluidine red is the best all-round red manufactured today for the paint trade. It is lighter in shade than the para, more permanent, and does not sublime as easily. It is probably the most permanent red used, being much preferable to English vermilion. The only part that gives way in a toluidine prepared paint or enamel is the vehicle, not the red. It will stand for years to permanent exposure and will remain as bright as the day it was exposed, if the vehicle will not perish. It is my opinion that before many years pass it will substitute light para reds entirely. If a deep shade can be developed it will mark a new era in reds for paint manufacturers.

In conclusion, let me remind you that covering power of pigments are dependent on three things:

(1) Fineness of division.
(2) Refractive index.
(3) Oil absorption.

It should be the effort of every dry color maker to precipitate colors in as fine a division as possible, and in the subsequent processes to try and retain this dispersion of particles.

The index of refraction is equal to the sine of the angle of incidence over the sine of the angle of refraction. To get the maximum in covering power the refraction indices of the vehicle and the pigment should be as far apart as possible. A water paint covers better than an oil paint, owing to the fact that the refractive index of water is less than that of oil, the pigment remaining the same in both cases.

Opacity increases inversely with the amount of oil absorbed by the pigment. White lead does not take as much oil to grind or to thin as zinc oxide. As a matter of fact the index of refraction of white lead and zinc oxide are quite close together, but on account of the zinc taking more oil it does not cover as well, brushful for brushful, with a lead paint.

CANADIAN COAL REVIEW FOR 1920.

A report from Department of Statistics, Ottawa, Metallurgical and Chemical Division, shows that during 1920 the output of Canadian mines was 16,696,568 short tons against 13,919,096 short tons in 1919, an increase of 21.9%. The year shows the highest production yet. Exports increased to 2,558,223 tons, compared with 2,070,050 tons in 1919.

Imports from the United States soared to 20,815,596 tons. In 1919 there were 16,982,773 tons. Saskatchewan was the only province which went behind during the year. Alberta was responsible for 41% of the total supply, with Nova Scotia 37% and British Columbia 18.3%.

For the whole of Canada, bituminous imports amounted to 15,902,637 tons in 1920, an increase from 12,010,490 in 1919. Anthracite imports in 1920 from 1919, dropping from 4,972,283 to 4,912,961 short tons.

The report is most detailed and valuable, giving imports to towns and cities and labor statistics in mines. It was prepared under the direction of S. J. Cook.

OBITUARY

The death occurred at the General Hospital, Sault Ste. Marie, Ont., of Charles E. Duncan, general superintendent of the Algoma Steel Corporation, following an operation for appendicitis. The late Mr. Duncan was held in high esteem by a wide circle of personal and business friends. He was born in Chattanooga, Tenn., but lived in Johnstown, Pa., most of his life, where he started in the Homestead Works of the Carnegie Steel Corporation, and worked in every department of the steel and iron business until he knew the practical side of the steel business as few men do. He entered the services of the Algoma Steel Corporation in 1909 and was general superintendent until 1915, when he returned to the United States, where he was employed until 1920, when, upon the death of the late David Kyle, general manager of the Algoma Corporation, he was recalled to the post of general superintendent, taking the place of Mr. J. D. Jones, who was promoted to Mr. Kyle's position.

Annual Meeting of Canadian Institute of Mining and Metallurgy

Report of Proceedings of 23rd Annual Session, Montreal, March 2-4

THE twenty-third annual meeting of the Canadian Institute of Mining and Metallurgy (formerly Canadian Mining Institute) was held at Montreal, March 2-4, 1921. Because of the change in place of meeting from Ottawa to Montreal, necessitated only a few days before the sessions opened, the meeting experienced considerable difficulty in making suitable convention arrangements. In spite of this difficulty the meeting was a success and well attended.

On Wednesday, March 2nd, the opening session began with the address by the retiring president, Mr. O. E. S. Whiteside. In his address, Mr. Whiteside referred to the Institute as being the voice of the mining industry as a whole, not simply of the mining engineers, and for this purpose he urged that the Institute's system of Branch Organizations be expanded to comprehend Provincial Divisions to which specific duties might be delegated. In this connection it would be impracticable and frequently impolitic for Provincial Governments to be approached on strictly provincial issues in any other way than by a duly accredited body of members resident in that province.

Mr. Whiteside urged co-operation with the Manufacturers' Association, Boards of Trade, and the press. In conclusion he referred to the problem of coal supply for Canada as the most vital issue before the Institute, and the problem must be regarded as a national one and so attacked. Independence in the matter of fuel supply was something very much desired and was, he believed, in a great part attainable.

Mineral Output, 1920.

Mr. John McLeish, Chief of the Division of Mineral Resources and Statistics, Ottawa, presented the preliminary report of mineral production of Canada, 1920. The report showed in 1920 the highest total value of mineral production yet attained in any year. Mr. McLeish pointed out that selling prices had increased so greatly that values were not a safe guide to actual increase of production, but nevertheless there were a number of important increases in tonnage production during 1920, including the items of coal, copper, gold, nickel, zinc, asbestos, magnesite, mica, quartz, salt, cement and all structural materials. Particular attention was directed to increase of non-metallic minerals in Canada during 1920, which Mr. McLeish said gave evidence of "remarkable growth and development."

Mr. T. W. Gibson, Deputy Minister of Mines of Ontario, presented the report of the mineral production in Ontario in 1920, for the compilation of which Mr. W. R. Rogers, the Statistician of the Bureau, was chiefly responsible. Figures for the different minerals will be found in this issue elsewhere.

Mr. Theo. C. Denis, Superintendent of Mines for Quebec, in giving the mineral production for Quebec Province for 1920, referred to the large increase in the tonnage and value of asbestos mined. Asbestos production reached 177,605 tons, valued at $14,674,572.

Papers Presented.

Several papers of exceedingly high value were presented to the meeting at the different sessions. A comprehensive paper on "Principles of Copper Leaching and Precipitation" was read by Mr. F. E. Lathe of the British American Nickel Corporation. The paper dealt with methods of grinding and roasting, comparisons of solvents in present use, principles of solutions circulation, and the choice of anodes. Fused magnetite and ferro-silicon anodes have been found suitable for some South American plants. Mr. Lathe referred particularly to the difficulties arising from ferric salts, and with the current densities in the electrolytic deposition stage.

Mr. E. P. Mathewson said that current densities should be increased, and ferric salts should not be allowed to accumulate to the detriment of electrolytic deposition. Greenawalt's experiments indicated that he was working in the right direction and promised a much wider application of leaching processes.

Dr. Stansfield referred to the process of reduction of iron ores by gases, resulting in the formation of a fine metallic powder, which was a particularly suitable medium for copper precipitation from solutions. Mr. Lathe said sponge-iron had been used at Anaconda by Mr. Mathewson, who explained that while it formed an ideal precipitant, it cost too much to produce and scrap-iron had been reverted to.

Mr. W. E. Simpson of the Miller-Independence Mine, in a paper on "Suggestions for the Better Development of the Mineral Resources of Northern Ontario," urged the establishing of leasehold titles which would force the title holder to operate his claim, in place of the present freehold titles. He also advocated publicly owned treatment mills.

Mr. T. W. Gibson did not agree with Mr. Simpson's suggestion for leasehold titles and instanced the United States as a great mining country where freehold tenure had always maintained. Mr. A. A. Cole believed there was need for treatment mills, conveniently located as to power, as recommened by Mr. Simpson.

Mr. J. P. MacGregor of Toronto, read a very interesting paper on "Blue-sky Laws as they Affect the Mining Industry," in which he strongly urged the passing of such legislation in all the Provinces as has been proposed for Ontario, whereby no corporation should issue stock without disclosure of the relevant facts. At the conculsion of his address, Mr. MacGregor moved the following Resolution, which carried unanimously:

"That this meeting of the Institute do approve of the principles of legislation commonly known as 'Blue Sky Law' as being of help to the conservation of Capital and for the prevention of fraud, imposition and unfairness in the sale of securities and that it is in the best interest of the mining and metallurgical industries of Canada that legislation of this character, as outlined in the paper pre-

sented, should be enacted in all provinces of Canada, where such securities are offered for sale."

Radius of Transportation of Western Coal.

Mr. James McEvoy gave a valuable contribution to the solving of this problem by dealing with the radius of transportation of western coals as shown by their economic worth at the point of destination. The problem of the use of western coal being so largely one of transportation costs, Mr. McEvoy analyzed the ability of the several grades to stand these costs applied upon their pitmouth costs.

He divided the western coals into the following divisions, and gave a figure representative of their relative heating value:—

	Relative Heating Value.
A. High-grade bituminous from Kootenay......	9
B. Sub-bituminous from Belly River	6
C. Lower-grade bituminous from Edmonton....	4½

The difference in heating value did not correspond exactly with the B.T.U's.

By means of charts Mr. McEvoy showed the economically transportable distance of the three grades of coal, and showed that a purchaser could afford to buy "A" grade and pay freight for a thousand miles, and still have the same value as if he bought "C" grade and received it at the same point free of freight charges. That is, if "C" coal is hauled a thousand miles with profit, it should be possible to haul "B" coal 1,666 miles and "A" 3,000 miles.

Regarding the possibility of supplying Ontario with the higher grade coals—which are situated at the greatest distance from Ontario—Mr. McEvoy said it resolved itself into a question of freight rates, which are supposed to be based on cost. He thought it was not too much to hope that train operating costs could be reduced by one-half for this class of traffic if the following conditions were fulfilled: (a) Powerful locomotives; (b) Maximum trainloads; (c) Through trains. The consumer would have to do his part by ordering his coal at those seasons in which the railways could handle it.

Mr. W. E. Simpson asked why the paper had ignored the question of oil and oil-shales, but it was explained that these matters had been dealt with in previous papers, and were not properly included in a discussion of the coal-supply problem.

Development of Canadian Iron Ores.

Mr. Cowie of the Algoma Steel Corporation stated that the present was a very serious situation. The Moose Mountain Iron Mine had closed down and the Algoma company would in all probability be compelled to close its ore mine.

Mr. T. B. Caldwell suggested that the Dominion Government should set aside a sum of money for the intensive testing and drilling of some promising iron-ore area. The cost of drilling could be recouped from royalties imposed on iron-ore shipped from the properties proved.

Mr. B. Neilly said that the iron and steel industry and national progress were directly related. There are Canadian ores that can be beneficiated, but not to meet American competition. The discussion as to whether a bounty should be paid or whether an appropriation should be made he thought was immaterial, as it was the same thing. He moved a resolution that:

"Whereas the importance of the iron and steel industry is apparent, and only five per cent. of requirements is supplied from domestic iron ores, that this meeting go on record as advocating in principle the payment of a bounty on beneficiated iron-ores."

Dr. Stansfield referred to his experiments in electrical smelting. There were two main difficulties in Canada, first, the supply of iron ore and secondly the supply of fuel. There was in Canada a considerable supply of electric power, and he had been experimenting for some years to devise a process to suit local conditions. It seemed now somewhat probable that the improvements which have been made in the reduction of iron-ore at temperatures lower than their melting point will bring the possibility of electric smelting into the region of practical operation. The process in general is to crush the ore, heating it, or mixing it with some form of carbon at temperatures about 800 degrees for hematite, or 900 degrees for magnetite, and making an iron sponge, which is the starting point for subsequent electrical furnace treatment. Dr. Stansfield said it seemed to him quite probable that before long we should be able to reduce hematite ores so reasonably that their commercial utilization will be possible. This would alter the complexion of the iron-ore situation in Canada, and the process might permit the utilization of low-grade fuels such as peat and wood.

The social side of the meeting was well managed and the annual dinner was a most successful feature.

Chemical Society News

NEW MEMBERS CANADIAN INSTITUTE OF CHEMISTRY.

The following have been admitted to membership in the Institute during the past month:

Ross Earlby Gilmore, Esq., 258 Girourard Ave., Montreal, Que.

Clifford Bruce Mohr, Esq., 524 St. Ambroise St., Montreal, Que.

Charles Wellington Simmons, Esq., 55 William St., Kingston, Ont.

Waldemar Carl Klotz, Esq., c/o Canadian Ammonia Co., Ltd., Toronto, Ont.

Albert E. Heys, Esq., Room 77, Toronto Arcade, Toronto, Ont.

William Raywood Werther, Esq., c/o Algoma Steel Corporation, Sault Ste. Marie, Ont.

SHAWINIGAN FALLS SECTION, SOCIETY OF CHEMICAL INDUSTRY.

A meeting of the Shawinigan Falls Section of the Society of Chemical Industry was held at the Technical Institute on the evening of March 12th. Dr. F. W. Skirrow, chairman of the section, in a few words introduced Dr. John S. Bates, formerly director of the Forest Products Laboratories of Canada, who spoke on the subject, "Pulp and Paper."

The speaker gave a general survey of the pulp and paper industry, bringing out points of special importance in Canada. The subject of forestry should be taken more seriously by the public, said Dr. Bates, because the time has come when plans must be carried out on a large scale to protect and reproduce our crop of trees for all the wood-

using industries. Canada stands next to Russia and the United States in remaining wood resources, but even this strong position must be protected to give permanent supplies for ourselves and the rest of the world. Forest fires have burned down ten times as many trees as the loggers have ever cut. In the east there are still large supplies of pulpwood trees, but British Columbia has most of the big timber. Fortunately, over 90 per cent. of the timber land remains under government ownership and the problem is fairly simple if the public will only demand and assist government action to save the forestry situation. Over two-thirds of the land area in the settled portion of Canada are unfit for agriculture, so there is plenty of room to have an everlasting forest.

The pulp and paper industry now heads the list of manufactures in Canada and also leads all others in export trade. This may be traced directly to the natural resources of pulpwood and water powers. To a large extent paper is made from raw materials not suitable for other purposes. Cotton goes into textiles and the waste clippings, rags and linters, supply the higher grade paper mills. The best trees are cut into lumber while the smaller sizes and inferior species are good enough for most grades of paper products.

Wood is the outstanding source of fibre for paper-making, and for very good reasons. The natural fibre length is just right, the yields of pulp are high, wood is cheap, abundant and compact, and finally it floats down our rivers and is easily handled. The conifers, such as spruce, balsam fir, hemlock and jack pine are low in resin content and have fibres about one-eighth of an inch long, while the width is only one-hundredth of the length. The hardwoods, such as poplar, basswood and birch are more resistant to pulping and have fibres about one-third the size of the softwoods, so that their use is more limited. Lantern slides of actual wood sections and pulp fibres were shown to illustrate the structure of the tree and the fibres that can be separated from different species. From the chemical point of view wood is about half resistant cellulose and the problem in making chemical pulp is to dissolve out the lignin and other carbohydrates in order to separate the flexible, white cellulose fibres.

The speaker outlined the groundwood, sulphite, sulphate and soda processes by which wood is converted into mechanical and chemical pulp. The characteristic properties of the different kinds of pulp fibres were illustrated by samples of paper pie-plates, newsprint, wrapping paper, board products, magazine paper, writing paper and bank note paper. The methods of beating, bleaching, sizing and loading to give the desired formation and finish were described. In conclusion, the scientific trend of the industry in the direction of improvements in processes and machinery, saving of by-products and quality of products was pointed out.

After a lively discussion by some of the pulp and paper men present the meeting adjourned to attack the eatables liberally supplied by the entertainment committee.

F. E. DICKIE,
Secretary.

MONTREAL SECTION, SOCIETY OF CHEMICAL INDUSTRY.

On Thursday March 17, the March meeting of the Montreal Section was held at the Queen's Hotel, with Mr. C. R. Hazen in the chair. Members and friends to the number of twenty-four sat down to the usual excellent dinner about 6.45. Owing to the small number present the singing, which has been a feature of the meetings this year, was dispensed with, and after the toast, "The King," had been honored in the usual way, the chairman called upon Mr. S. P. Newton, the speaker for the evening, to present his paper on "Insecticides, Their Manufacture and Application." In his opening remarks, Mr. Newton, who has had long experience in the manufacture and preparation of insecticides, presented some very interesting statistics on the various types used in Canada for the destruction of orchard and garden pests.

Mr. Newton then described the different forms of crop injuring insects and the means taken to combat these. The speaker mentioned particularly the plague of grasshoppers in the western wheat belt last year and told of the fight which had to be waged before these insects were destroyed.

Mr. Newton, an enthusiastic gardener himself, found quite a few devotees in the audience who were all attention when it came to hearing something which would make their hobby more interesting and productive.

In the discussion which followed, Messrs McKenzie, Beidleman and others took part.

Before the meeting closed, the chairman intimated that it was necessary to appoint the Nominating Committee who would prepare a list of names for election for the next session, 1921-22, these comprising Chairman, Secretary and members of the Executive Committee.

The meeting requested the chairman to name the committee and those appointed were Messrs. Robt. Job, Saunders and Adams; nominations to be presented at the annual meeting in April.

GEO. D. McINTYRE,
Secretary.

TORONTO SECTION, SOCIETY OF CHEMICAL INDUSTRY.

The most successful meeting of the Toronto Section, Society of Chemical Industry, held during the 1920-21 term, and styled by many as the most successful ever held by the Toronto Section, took place at Hart House, University of Toronto, Monday evening, April 4th. Over eighty members and guests were present, and included among the latter were some of the most distinguished scientists and educationalists of the Dominion.

The speaker of the evening was Dr. C. E. Kenneth Mees, Director of the Research Laboratory of the Eastman Kodak Co., Rochester, N.Y. Among those present were: Sir Robert Falconer, President of the University of Toronto; Sir Frederick Stupart, Director of the Meteorological Office, Toronto; Dr. J. C. McClennan, head of the Department of Physics, University of Toronto; Professor Field, of the Department of Mathematics, University of Toronto, President of the Royal Canadian Institute; Professor Chant, Professor of Astronomy, University of Toronto; Mr. J. S. McKinnon, President of the Canadian Manufacturers' Association, together with one of the largest representation of members of the Section that had ever attended a local meeting.

Following the usual informal dinner the members and guests adjourned to the lecture hall, where Mr. M. L. Davies, Vice-President and General Manager of the Standard Chemical Company, Chairman of the Section, introduced Dr. Mees to the gathering. In his remarks Mr. Davies said that he did not feel that after the great

work that Dr. Mees had done in connection not only with photographic chemistry, but also in his capacity as one of the best-known exponents of industrial research, that there was any need of introducing him to the chemists and physicists present. While Dr. Mees was now engaged in directing research work for one of the largest industries in the United States, he was a native of England, a graduate of the University of London, and was thus especially welcomed to a Canadian audience.

The subject of Dr. Mees' address was "Measuring the Stars by Light Waves," and opened up to those present, particularly to those whose avocations had not permitted them to stray very far from their laboratory or office, a wide vista of thought that could not fail but bring fresh inspiration.

Dr. Mees emphasized that he was speaking as a brother chemist to chemists on a subject which was largely a matter of physics."But it would be a good thing if our chemists knew a little more physics, and likewise I always maintain, especially when in the hearing of physicists, that it would be equally as good for our physicists if they knew a little more chemistry," said Dr. Mees. He recognized, of course, that time very often prevented one from doing anything at a subject other than that which was directly applicable to his work, but it was a good thing to occasionally take a "peek over the fence" and see what the other fellow was doing.

The first part of Dr Mees' address dealt with an explanation of the principles of the interference of light, from which principle was derived the instrument known as the intrferometer. The great work that Michelson, of the University of Chicago, had done on the subject was reviewed by the speaker, and lantern slides were used showing how it became possible to make accurate measurements of distances in terms of the amount of interference of the light waves. The immense amount of work and calculation it took Michelson to find out the exact fraction of a millimetre, the light and dark bands seen through the interferometer represented, was referred to. and that from these observations Michelson was enabled to state in definite terms, and in terms of something that could not be destroyed (namely, light waves), a new definition of the metre. Further research by Michelson brought out the theory that it was possible by use of the interferometer to measure the size of the stars, and by attaching a large interferometer to a large telescope, the theory was proved correct and practical, and for the first time in history the diameter of the giant star Capella was determined. "It was always known," said Dr. Mees, "that Capella was an immense distance from the earth, for it takes light over 200 years to travel from Capella to the earth, and we should be devoutly thankful that it has been placed so far away, for Michelson determined its diameter to be 150 million miles." ..

Some chemical applications of physical instruments were hinted at. Dr. Mees suggested that the analysis of gases could be simplified by using the difference which minute quantities of some gases made in their refractive power to light waves. It was suggested that the presence of very small amounts of CO_2 in air, or water in absolute alcohol, might be measured in this way, although the chief application would be to gaseous solutions.

Exact measurements of the rate and amount of expansion of metals can best be made by physical instruments where light fringes of known dimensions are taken as standard lengths. One of the great new applications of light-wave measurements has been in the making of lenses. The firm, Adam Hilger, Ltd., worked out an instrument which detects imperfect lenses. They may be ground flat, but because of the imperfect mixing of the glass, or presence of impurities, they do not transmit light in a uniform manner By this instrument the imperfections in the glass are made evident, and the lens may be ground down in the definite spots where this is necessary.

At the conclusion of Dr. Mees' address the chairman called on several of the distinguished guests present for a few remarks. Sir Robert Falconer said that he had been deeply stirred by the address, and he had been led to think again of how much we owe to men of science. He did not believe that the object of science was, or should be, merely to make men more comfortable, nor was science's chief value in the attainment of mere knowledge, but it was rather the wide view of the whole universe that science opened up that made it of so much valne to mankind. The inspiration that resulted from having men of Dr. Mees' standing come among us was perhaps, after all, the chief benefit derived.

Sir Frederick Stupart, in moving a vote of thanks to Dr. Mees, referred to the vast field of research that Michelson had opened up, and expressed his vast appreciation of the address of the evening.

Dr. McClennan had greatly enjoyed the address, and referred in glowing terms to the wonderful work of Silverstein in optical science. He was particularly pleased with the Adam Hilger Co. of England for the way they had organized their research work and had developed the latest optical instruments. He took great pleasure in seconding the vote of thanks to Dr. Mees.

Professor Chant referred to the great field of research that Michelson had opened up in astronomical science. Professor Field paid tribute to the great sciences of chemistry and physics, and spoke of the need of a greater appreciation of all the sciences, including biology.

Mr. McKinnon declared that every available means should be used to show to the Government the need of industrial research. He complimented the Society on the splendid work it was doing, and gave assurance that the Manufacturers' Association were with them in their struggle for more assistance to research work.

MEMORANDUM OF REGULAR MEETING, TORONTO BRANCH ENGINEERING INSTITUTE OF CANADA.

Held At the Engineers' Club, Thursday Evening, March 31st, 1921.

In the absence of the chairman and vice-chairman, Mr. T. Linsey Crossley occupied the chair.

The meeting was addressed by Mr. C. Nelson Gain, of the Don Valley Paper Company, who discussed the subject of paper making, and showed a number of interesting slides illustrating the development of the industry and showing the importance of accurate mechanical adjustments, especially in the speed control of the paper machine.

An interesting discussion followed, covering a number of points in the technology of pulp and paper making, which was participated in by a number of the members present.

At the cose of the meeting the party extended a vote of thanks to Mr. Gain. In replying Mr. Gain invited any

of the members present to visit the paper mill, and several members declared their intention of forming a party to visit the mill on Saturday afternoon, April 2nd.

BALLOT FOR PROVISIONAL COUNCIL UNDER PROPOSED PROFESSIONAL ENGINEERING LEGISLATION IN THE PROVINCE OF ONTARIO.

The Ontario Association of Professional Chemists recently organized in a temporary way, has taken a ballot for members of Provisional Council so as to prepare the way for the passing of new legislation, licensing professional scientists and engineers.

A total vote of 84 was recorded and the following three gentlemen were elected to represent the Chemists of Ontario:—

Professor J. Watson Bain, Toronto 82
Dr. S. F. Kirkpatrick, Ottawa 78
Dr. H. Van der Linde, Toronto 76

MEETING OF MEMBERS OF CANADIAN INSTITUTE OF CHEMISTRY AT TORONTO IN MAY.

It is being suggested that a professional meeting of members of the Institute who may be able to attend, and other interested chemists, take place in Toronto, Friday, May 13th. Meetings will be held at the University and a tentative program will call for one or two papers, probably one on biochemistry and one on electric furnace work, with possibly a number of "10 minute" descriptions of the work being done by members of the Institute. This will be the first professional meeting of the Institute except annual general meetings, and it is hoped that members who can arrange to be present for the day will do so. Further details will be developed later.

Editor, Canadian Chemistry and Metallurgy,
Toronto, Ont.

Dear Sir,—In article, "The Chemist and the Crude Factory in the Hardwood Distillation Industry," by myself, published in the February issue of your journal, I wish to point out the following errors:—

1.—Page 38, column 1, line 11—should read "(e) Pulling the cars of charcoal from the ovens."

2.—Page 40, column 1, line 9—in paragraph beginning "By means of this reflux, etc.," should read 0.2%, instead of 2% as printed.

3.—Page 40, column 2, line 9—the word "moisture" should be inserted between the words "maximum" and "content"—and should read "Maximum moisture content."

4.—Page 41, column 1, line 22 and 23—should read "Calcium Acetate, As Received 81.0%."

I am at a loss to understand just how these errors crept in, whether in manuscript or galley-proof. However, may I request that a correction be published in your next issue, especially for No. 2, above, which is the most serious.

Yours very truly,

R. E. GILMORE, Chief Chemist,
Standard Chemical Company, Limited.

Montreal, March 1st, 1921.

[Editor's Note.—These mistakes undoubtedly arose from our taking a copy of the article as reported for a Montreal meeting of the Society of Chemical Industry, and not afterwards submitted to the author, rather than a more carefully corrected original.]

BOOK REVIEWS

"Benzol—Its Recovery, Rectifications and Uses."

By S. E. Whitehead, Benn Brothers, Ltd., London; D. Van Nostrand Co., New York; 196 illustrations, pp. 209. Price, $5.00 U.S.A.; 13s. 6d., England. (Prices subject to duty).

The collection of benzol from all sources was greatly stimulated during the period of recent high demand. As a result, operations were investigated as never before and the practice of extracting benzol from coal gas was undertaken in all gas plants of any size. This book gives much of the information gained in England and elsewhere during this period and is a valuable record of scientific achievement and data reduced to book form.

The author is to be recommended for the number of illustrations introduced. They are of the type that actually assist the intensive reader.

The book is divided roughly into three parts dealing with (1) Recovery of Benzol from gas. (2) Rectification of Benzol. (3) Uses of Benzol and its products. An appendix gives considerable information on the analysis of crude benzol.

Practical considerations receive very detailed treatment. Theoretical complications are not avoided, but the book is designed as an industrial effort of the highest type rather than a special chemical treatment of any number of hydrocarbons. While there may be at present a limited field of application in Canada, the book can be recommended to all who are directly concerned or interested in the data covered.

"Thermodynamics and Chemistry."

By F. H. MacDougall; 388 pp. John Wiley & Sons, New York, N.Y. Price, $5.50, U.S.A.

We think this book will be made welcome on the desks of teachers and students in chemistry. The author strikes his key-note when he states that no one can write on thermodynamics without being deeply influenced by Willard Gibbs and Max Planck. A working knowledge of the calculus has been, and is yet, one of the great weaknesses of many post-graduate students in chemistry and their teachers in many instances. The broadening out of the science of chemistry is essential, and to date very few books have appeared which in various ways did not excuse the student from effort. The result has been that few graduates have the power of mathematics and physics behind their chemistry. To the student of physical chemistry the book will be found sufficiently advanced to call for his best concentration and yet leave him a higher plane in the original papers of Gibbs and others.

As a supplementary reading text it should be most valuable for the problems submitted and the mathematical presentation of the usual laws and equations. Nothing essential to the subject seems to be omitted and the whole is well balanced.

Perhaps the organic chemist of the future will find a larger use for similar fundamental equipment in his work and for those who for any reason have not had an opportunity to read thermodynamics with their chemistry, but who wish to have available some single good reference for study, this work can be recommended.

Mineral Production, Ontario, 1920

The following table, subject to revision, summarizes the mineral production of Ontario for 1920. As far as possible, the figures represent quantities shipped and values received for marketed products. Tons throughout are short tons of 2,000 pounds. Final figures for 1919 are included for comparison.

Product	— Quantity —		— Value —	
Metallic.	1919	1920	1919	1920
Gold, ounces	505,964	564,309	$10,451,709	$11,665,735
Silver, ounces	11,363,252	10,968,358	12,904,312	10,819,678
Platinum metals, ounces	1,770	282	200,000	18,009
Copper, lbs.	5,684,183	6,825,772	969,024	1,041,994
Nickel, metallic, lbs.	10,202,308	11,015,692	3,592,984	3,852,141
Nickel, oxide, lbs.	1,498,577	4,890,571	341,833	1,151,490
Cobalt, metallic, lbs.	121,925	167,750	243,554	392,926
Cobalt, oxide, lbs.	426,573	569,182	624,553	1,210,810
Other cobalt compounds, lbs.	199,487	1,717	141,372	1,629
Nickel, sulphate and carbonate, lbs.	353 267	159,725	46,711	15,362
Lead, pig, lbs.	1,529,987	2,247,914	94,507	180,951
Copper in matte (a) tons	9,431	11,715	2,740,663	2,928,750
Nickel in matte (a), tons	15,581	21,371	7,990,403	10,685,500
Iron ore, exported (b), tons	5,953	6,769	48,341	59,647
Iron, pig (c), tons	46,769	76,164	1,200,793	2,204,205
Total metallic	....	....	$41,590,759	$46,228,827
Non-Metallic				
Actinolite, tons	160	100	$ 1,176	$ 1,160
Arsenic, crude and white, lbs.	5,668,170	3,765,611	485,360	431,527
Clay products—				
Brick, common, M.	141,255	115,420	1,966,711	2,047,543
Brick, fancy and pressed, M.	31,738	29,254	539,908	724,031
Tile, drain, M.	13,009	7,792	354,700	263,429
Tile, hollow building, tons	17,435	....	184,900	317,233
Tile, roofing	....	....	1,692	3,379
Pottery	....	....	119,551	127,049
Sewer pipe	....	....	609,100	860,811
Cement, Portland, bbls.	2,022,575	2,035,594	3,659,720	4,377,814
Corundum, bbls.	....	196	....	27,000
Feldspar, tons	14,787	16,760	88,663	122,569
Fluorspar, tons	3,425	3,704	60,389	67,381
Graphite, crude and refined, tons	1,340	1,956	99,841	132,882
Gypsum, crushed, ground and calcined, tons	59,899	74,707	278,111	404,162
Iron Pyrites, tons	117,178	148,651	366,422	618,283
Lime, bushels	3,911,572	4,320,225	1,268,290	1,532,627
Mica, tons	567	717	56,199	51,493
Mineral water, Imp. gallons	276,833	127,150	19,290	11,500
Natural gas, M. cubic feet	11,085 819	11,500,000	2,583,324	3,450,000
Peat, tons	500	3,900	1,750	15,600
Petroleum, crude, Imp. gallons	7,703,515	6,361,234	632,789	724,145
Phosphate (apatite), tons	2	....	31	....
Quartz (silica), tons	59,658	94,650	179,070	366,441
Salt, tons	148,112	206,612	1,395,368	1,544,867
Sand and gravel, cu. yds.	1,065,851	2,000,000	501,666	1,300,000
Sand-Lime brick, M.	27,661	27,703	367,815	410,952
Stone, building, trap, granite, etc.	....	....	1,230,922	2,074,944
Talc, crude and ground, tons	17,571	15,990	240,399	269,182
Total non-metallic	....	....	$17,293,157	$22,227,954
Add metallic	....	....	41,590,759	46,228,827
Grand total	....	....	$58,883,916	$68,456,781

(a) Copper and Nickel exports in the form of matte were, in 1919, valued at 14 and 25 cents per pound, respectively, and at 12½ and 25 cents in 1920.

(b) Total shipments of iron ore were 195,915 tons in 1919, and 126,710 tons in 1920.

(c) Production from Ontario ore only. Total output of blast furnaces was 623,586 tons of pig iron, worth $16,010,537 in 1919, and 748,193 tons, valued at $21,652,308, in 1920.

The value of the 1920 production of metals in Ontario is greater than for any pre-war year, while the non-metallic valuation is the largest in Ontario's history. Following is given some details regarding output and conditions in the more important phases of the industry.

Gold.

For some years prior to 1903 the output of gold exceeded that of silver. This position was reversed in 1904 when the silver mines of Cobalt began to produce. The pendulum has swung back again, and Ontario's gold production for 1920 exceeds that of silver. Despite labor scarcity and high operating costs for the first nine months of the year, followed by shortage of hydro-electric power during the last quarter, the yield of Ontario's gold mines was the largest in the history of the Province. The climb upward began with the discovery of Porcupine in 1909. Canada, in 1919, owing to Ontario's contribution, was the only country in the world to show an increased output of gold. So far as known this same statement applies for 1920. Porcupine and Kirkland Lake are now recognized as important gold camps. The Davidson and Dome Lake mines at Porcupine were closed at the end of the year.

The recently issued geological report on Kirkland Lake, by A. G. Burrows and P. E. Hopkins, will do much to enlighten the public regarding the extent and possibilities of this gold area. The Wright-Hargreaves 150-ton mill is complete, and ready to operate in the spring when electric power is available. A start has been made on the mill by the Ontario-Kirkland. Developments in Lebel township, east of Kirkland Lake, are promising.

Silver-Cobalt.

On January 12th, 1920, the price of silver was $1.37 per ounce, the highest on record during the history of the Cobalt camp. The slump which followed was gradual until the lowest quotation for the year, 59¼ cents per ounce for foreign silver on the New York market, was reached on Dec. 10th. This decline in price, accompanied by hydro-electric power shortage late in the year, due to scanty precipitation during the summer and fall, were the occasion for certain mines closing down or curtailing output. In the recently issued annual statement the La Rose mine, for example, reports a small net loss on the year's operations, silver costing 73 cents per ounce to produce. The price realized by the mines on the cobalt content of ores marketed was much higher than in former years. Payment of $560,078 was received for 977,270 pounds of cobalt shipped.

Silver production from Gowganda came from the Miller Lake O'Brien and Castle mines, the latter property being operated by the Trethewey Company. From gold and

nickel-copper refining, respectively, 99,255 and 37,957 ounces of silver were recovered.

Mines shipping over a quarter million ounces of silver in 1920 are given in order:

Nipissing	3,390,537	ounces
Mining Corporation of Canada	1,806,274	"
O'Brien	1,179,706	"
Coniagas	990,176	"
McKinley-Darragh-Savage	613,428	"
Kerr Lake	601,604	"
La Rose	492,801	"
Miller Lake O'Brien	376,417	"
Temiskaming	298,627	"

Refineries.—The three plants at Deloro, Thorold and Welland treated 4,196 tons of ore and concentrates, and 4,792 tons of residues, for a recovery of 3,464,212 ounces of silver in addition to arsenic, cobalt and nickel in various forms as noted in the table of production. The plant of Metals Chemical, Limited, at Welland, was sold to Ontario Smelters and Refiners, Limited, the transfer taking effect on April 1st. The last mentioned company remodelled the plant and reported a small production, chiefly of cobalt and nickel oxides from residues on hand.

Nickel-Copper.

Furnaces were charged with 754,567 tons of nickel-copper ore in 1919, and with 1,559,892 tons in 1918, the year of maximum production. For the first nine months of 1920 the quantity of ore smelted at Copper Cliff, Coniston and Nickelton was 809,222 tons. During the last quarter of the year, however, the market for nickel and copper was dull, prices dropped, and stocks accumulated. In consequence, the International Nickel Company of Canada curtailed its output by 25 per cent. on November 1st, thereby reducing production to 3,000 tons of nickel-copper matte and 400 tons of refined nickel per month. A further reduction in output has since been made by this company. The mine and smelter of the British America Nickel Corporation closed down on February 26th, 1921. Similar action will follow at the refinery as soon as matte shipped from the smelter has been treated. Vice-President W. A. Carlyle states that this action became necessary owing to bad market conditions for the products, nickel and copper.

The year 1920 marked the beginning of smelting and refining operations by the British America Nickel Corporation. In January the new smelter at Nickelton was put in blast. The resulting Bessemer nickel-copper matte, which is produced without preliminary roasting of the ore, is shipped to the electrolytic refinery at Deschenes, on the Quebec side of the Ottawa River. The ore comes from the old Murray mine, which was found by diamond drilling to contain large reserves. The new refinery, in which the Hybinette electrical process is employed, started operations during the second quarter of the year. Electrolytic nickel and copper are being produced, but no slimes have yet been treated for the recovery of gold, silver and metals of the platinum group. During 1920 the Port Colborne and Deschenes refineries treated 17,297 tons of Bessemer matte recovering 4,866,001 lbs. of nickel oxide, 10,811,155 lbs. of nickel and 6,695,596 lbs. of copper, in addition to the precious metals. The price of copper declined rapidly in the last quarter of the year, the average New York price of electrolytic for the year being 17.456 cents per pound. Incomplete returns by U. S. refineries show a recovery of 100,176 lbs. of copper and 6,906 lbs. of nickel from Ontario gold and silver ores.

OVERSEAS AND FOREIGN INDUSTRIAL NEWS

Special Correspondence to Canadian Chemistry and Metallurgy. By Our London Representative.

THE following report on the United Kingdom chemical trade during February has been published by Messrs. Sir S. W. Royse & Co., Limited, of Manchester:—

There has been only a limited business passing during February, and that principally for the home trade, the export demand being very poor. The values of most products have eased further, but consumers continue to cover only their immediate requirements. Sulphate of copper is again lower in spite of the firm position of the metal. Green copperas has been steadily called for. There has been little inquiry for acetates of lime, but a fair amount of business has been placed in acetate of soda. Acetic acid is unchanged. Acetates of lead continue to be neglected, and nitrate of lead has also been in poor request.

The demand for carbonate of potash and caustic potash is very moderate, and prices are lower. Stocks of Montreal potashes are ample. Sulphate of potash has an easier tendency. Yellow prussiate of potash has been receiving more attention, but the demand for prussiate of soda is still poor, and price is again lower. Cream of tartar continues to be pressed for sale by holders of stocks, and until these are cleared there seems little prospect of better prices. Citric acid has remained steady. Oxalic acid is again cheaper, and is offered freely from the Continent. Borax and boracic acid are unchanged, and there is little call for phosphate of soda.

New Yorkshire Industry.

A very interesting innovation during the past year on the Tees was the purchase of 600 acres by the Synthetic Ammonia and Nitrates, Limited. The works are to manufacture ammonia synthetically.

Franco-British Combination in Chemical Manufactures.

A number of French business experts, it is understood, are shortly to visit London to complete negotiations for what is called "an industrial entente."

France finds herself in possession of considerable supplies of raw potash in Alsace, but she is without the process-plant required to transmute the raw material into the higher forms of chemicals, of which chloride of potash is the basis. Great Britain possesses this essential plant, and it is proposed to combine the two.

Mr. Kenneth Chance, of the British Cyanides Company, Limited, whose works are at Oldbury, has recently visited Alsace in connection with the negotiations, and additional works may be erected in East Anglia.

Formosan Camphor Supply.

The fact that Formosa has a virtual monopoly of the world's camphor supplies, and that at present the future of the industry is far from bright, is likely to create a serious situation in the celluloid and other industries. Since 1916-17 there has been a heavy decline in the output of camphor, and from figures published in the Indian Trade Journal it appears that the estimated quantity of crude camphor and camphor oil produced in 1919-20 is only 2,200,000 kin and 4,200,000 kin respectively, as compared with 5,208,843 kin and 6,808,516 kin for the year 1916-17. The chief cause of the decrease is insufficiency of labor. Unfortunately, the decrease in the output of camphor has come at a most inopportune time, for the demand in the United States, the United Kingdom and Japan has increased enormously since 1914. The demand

for camphor in the United States is estimated at 7,800,000 kin per annum; while the United Kingdom is reckoned to require 2,400,000 kin and France 1,080,000 kin. No figures are available for the demand in Japan. As the United Kingdom and France take partly refined or "BB" camphor, which yields 12 per cent. more refined camphor than the "B" grade shipped to America, the proportion allotted to those countries is really larger than apparent. It is estimated that the existing camphor forests will be entirely exhausted about fifteen years hence. This does not take into account the production of synthetic camphor. The low price is seriously injurying this business in America.

Wood Distillation in Argentina.

Two factories near Cordoba, in Argentina, are making various pyroligneous products, including brown acetate of lead, acetates of lime, acetone, acetic acid and iron liquor, from the dry distillation of the wood of the algarrobo tree. The expense of operation on a small scale is so great that the imported products cost less in the market. They still have, however, certain opportunities for gain, notably in the preparation of vinegar, which requires an acid of high purity. They are favored also by the fact that the demand exceeds the supply at the present time, which should be an incentive to Canadian manufacturers to study the Argentine market in these particular lines. The particular factories in question distil twenty tons of wood per day. Their principal raw material consists of the chips and waste, by-products of the main business, which is the manufacture of wood paving blocks. Three Argentine companies are making 53 degree B. to 66 degree B. sulphuric acid by the chamber process, using sulphur imported from Italy, Chile and the United States.

Market in Argentina for Industrial Drugs and Chemicals.

It may be a matter of interest to many Canadian chemical manufacturers that an attractive and profitable trade is done in the Argentine market by European and American manufacturers of industrial drugs and chemicals. There is, of course, a certain amount of competition from local manufacturers, but inasmuch as the total value of chemical imports during 1919 amounted to no less than approximately $35,000,000, there is evidently a good market at the present time. Not only so, but in view of her increasing industrial developments, Argentina should, in the future, offer a large scope for the sale of chemicals. From figures published in an American consular report it appears that the principal chemical imports into Argentina during 1919 were (in kilos) heavy tar oil, 2,008,057; paraffin oil, 3,944,137; sulphuric acid, 1,495,972; dilute acetic acid, 608,288; alum, 1,371,874; carbonate of soda crystal, 1,569,867; calcium carbide, 2,851,519; chloride of calcium, 1,919,147; glucose, 2,474,110; common soap, 1,089,651; nitrate of soda, 1,241,168; rosin, 15,859,908; silicate of soda, 4,512,550; caustic soda, 6,542,906; soda ash, 3,459,303; solway soda, 5,877,829; sulphate of aluminium, 1,226,046; sulphate of barytes, impure, 1,237,194; sulphide of soda, impure, 1,514,507; varnishes, 1,036,174; colors, in lump or powder, 1,872,951; prepared colors, n.e.s., 4,085,583; crude sulphur, 7,167,741; sulphur powder or in cylinders, 2,639,981; carbonate of lime, chalk, 2,080,521. It is pointed out by those who have a knowledge of the Argentine market that direct dealing by the ultimate consumer with the factory would be impracticable in anything but specialties. Only those factories whose products are in extensive use or are augmented by purchases from other sources should have their own offices. Stocks amply diversified should be carried locally to supply small demands of customers and to enable the merchant to take quick advantage of any unusual market condition, the larger orders being sent from the factory. Buenos Aires would make an excellent distributing centre. Terms at present vary from cash on delivery of the goods, cash on the first pay day of the following month, to 90 days' credit. It is usual to quote a price on which there is 5 per cent. discount for immediate cash, and a discount of one per cent. less for each successive month over a five-month period, at the end of which the entire amount is billed as due and payable. Particular attention should be given to the question of weights and containers, especially in regard to materials such as rosin, acids, and paraffin, which are subject to unavoidable depreciation during transportation.

Carbide in Australia.

Now that the embargo has been placed by the Federal Government on the importation of carbide into Australia, the new industry established by the Hydro-Electric Company at Electrona, near Hobart, for the manufacture of carbide is expected to forbe ahead. The company has been having rather a bad time of late, and the State Government had to come to its assistance with advances to the extent of £50,000 in order to keep the industry alive until the prohibition, which is for twelve months, was brought into operation. The price at which the company is to sell must not exceed £30 per ton.

Tin Ore Exports from Malay States.

The Imperial Mineral Resources Bureau has received an advance statement from the Senior Warden of Mines, Federated Malay States, showing the quantities of black tin and tin ore exported, with appropriate values (in Singapore), during the months of January to November, 1920.

	Black Tin.		Tin Ore. (72% of gros. wgt)		Total Approximate Values. (in Singapore)	
	pkls.	kt.	pkls.	kt.	Dols.	Cts.
Perak	18,290	40	319,347	45	51,867,390	78
Selangor	42,532	04	107,479	50	23,267,692	60
Negri Sembilan	—	06	3,397	38	552,188	57
Pahang	2,687	13	45,487	46	7,507,671	07
Total	63,509	63	475,711	79	83,194,943	02

German Potash Industry.

The following report on the German potash industry, by Mr. J. W. F. Thelwall, Commercial Secretary to His Majesty's Embassy at Berlin, has been published recently by the Department of Overseas Trade in London:

At the beginning of 1920 a great improvement in the German potash industry, compared with the previous months, had taken place. This was due partly to the improved supply of coal.

German agriculture was supplied with from 80,000 to 100,000 trucks of potash in January and February, and was thus enabled to satisfy its requirements; in some provinces there was even an over-supply of raw potash salts.

At that time representatives of the Potash Syndicate were en route to the United States of America, in order to negotiate a large contract for the delivery of potash salts at good prices.

No large contracts with the United States had at that time been concluded, although America was the best market. Further, the competition of the Alsace works was beginning to be felt, particularly as they were able to interfere with prices in international markets. It was, however, felt that the world's needs of potash were so great that the demand was bound to increase, and the necessity of intensifying export became apparent.

For the first time since 1918 the Union of German Potash producers has issued a review of the situation from

January, 1919, to 30th June, 1920. One of the most interesting statistics contained in this publication is that showing the consumption of pure potash since 1911 to the end of 1919, as follows:

	Kilos.		Kilos.
1911	939,926,900	1916	839,975,900
1912	1,009,218,700	1917	1,004,281,400
1913	1,110,369,400	1918	1,001,664,300
1914	903,938,300	1919	812,002,400
1915	679,776,400		

At the outbreak of war the prices for potash salts were those fixed on 23rd of June, 1910, but as they rapidly became inadequate, new prices were introduced on 1st October, 1915; several subsequent increases became necessary, the last of which occurred on 3rd December, 1919. That these prices are still far from sufficient to cover even the cost of production is shown very strikingly by the following comparison of the prices in 1914 and in 1920 of potash salts:

Commodity.	1914 Marks. 100 kg.	1920 Marks. 100 kg.	Increase Per Cent.
Carnallite, 9 per cent	0.76	4.59	500
Kainit, 12 per cent	1.20	7.20	500
Potash manures, 20 per cent	2.80	14.80	429
Potash manures, 30 per cent	4.35	24.90	472
Potash manures, 40 per cent	6.20	38.80	526
Sulphate of potash, 48 p.c.	16.80	72.96	334
Chloride of potassium, 50 p.c.	13.69	57.50	326

The question arises as to whether the German potash industry should charge higher rates to German agriculture or should continue to deliver to the latter under cost price, making its profits on its foreign sales. It appears that the latter course had been adhered to.

The latest available information on the condition of the German potash industry is contained in the report of the meeting of the Potash Syndicate held on 15th October, 1920.

The price agreement which proved its value during and since the war, was renewed for 1921. It provides that those works which, through no fault of their own, have been prevented from contributing their quota, receive 15 per cent. of the revenue, while the remaining 85 per cent. goes to those which have exceeded their allotments.

The sales during the first nine months of 1920 amounted to about 800,000,000 kg. of K_2O, which is roughly 160,000,000 kg. more than in the corresponding period of 1909.

Since May, 1920, buyers in Germany and in other countries are holding back to a marked degree, although no rise in prices has taken place since December, 1919. In German agricultural circles a fall in the price of artificial manure seems to be expected; this is quite out of the question in view of the ever-increasing expenses; moreover, the prices for agricultural produce have also risen and to a much greater degree than those for potash.

Business with the countries bordering on Germany, such as the Netherlands, Belgium, Switzerland, Italy, Scandinavia, Czecho-Slovakia, Austria, has been satisfactory, though the inclination to buy is also slight in these countries at present. Deliveries to the Balkans, where there is a very fair demand, were until recently impossible owing to transport difficulties, but have lately been made by the Danube route.

The export prohibition for potash to Poland prevents the Syndicate from working an area which even before the war consumed over 10,000,000 kg. of pure potash. Business with Eastern Europe is at a complete standstill. An improvement can only be looked for after the definite conclusion of peace between the United States and Germany.

MINING AND METALLURGY IN BRITISH COLUMBIA.

(Special Correspondence to Canadian Chemistry and Metallurgy.)

The Granby Consolidated Mining, Smelting & Power Company has notified its employees that the continued low price of copper has rendered it necessary to make another reduction in the wage-scale, and that, commencing April 1, a cut of 25 cents per day would be made to all men working in the ore mines and smelter, but that it would not affect the employees at the company's Cassidy colliery, as their wage-scale is arranged on a different basis. The company continues to maintain its large output of copper, which now averages more than two and a half million pounds monthly.

Consolidated May Operate Copper Mountain Mine.

Though smelting practically no custom ore at the present time, the Consolidated Mining & Smelting Company is maintaining its zinc output, all the ore coming from the Sullivan mine, and recently it has considerably increased its gold and copper output, the ore coming from its Rossland mines. It is no secret, however, that, despite the present low price of copper, the company is desirous of extending its copper business, and that the Rossland mines, being primarily gold mines, are not providing enough ore to keep the copper smelter and refinery busy. Added to this, the new copper-rod mill is on the verge of completion and copper will be required to keep this plant active. Now that the British American Nickel Corporation has closed its plant at Nickelton and the refinery at Deschenes, Que., the Consolidated will, once again, have the only operating copper refinery in Canada, and, in order to take full advantage of the Canadian market it will be necessary to keep the plant in operation. Rumor has it that the Consolidated is contemplating operating the Canada Copper Corporation's mine, at Copper Mountain, and plant at Allenby. The Kettle Valley Railway, a subsidiary of the C.P.R., and the West Kootenay Light & Power Company, a subsidiary of the Consolidated, which is closely associated with C.P.R. interests, have a large sum of money tied up in the railway and power-line to the Canada Copper corporation's mine and plant, and if an arrangement could be made by which the Consolidated were able to operate the plant it might be the most satisfactory thing for all parties concerned.

Britannia Mill Destroyed by Fire.

The Britannia Mining and Smelting Company's concentrating plant at Britannia Beach, said to be the largest and most complete plant of its kind in the British Empire, was completely destroyed by fire recently. As reported in this journal at the time, the plant was closed on November 30, owing to the slump in the price of copper. During the eleven months of the year that it was in operation, the mill crushed 650,000 tons of ore, yielding a concentrate that produced 18,000,000 lbs. of copper. When worked at capacity the plant was capable of treating 2,500 tons of ore daily. The mill was built on terraces on the side of a mountain, and was 270 feet from the bottom to the top floor, the fire started in about the middle, nearly where the flotation-oil was stored. This is supposed to have added fuel to the flames, for soon after the fire started the whole building seemed to be a mass of flames. The loss is estimated at one and a half million dollars, and is partly covered by insurance. The president of the company, E. B. Schley, is in Europe at the present time, and no arrangements for re-building will be made until he is heard from. Fortunately, the men were able to confine

the fire to the mill; the power plant, one of the best equipped in the Province, and compressors, were uninjured, so the development at the mine will be continued.

Development Work at Silversmith Lead Mine.

Lead mining in the Province is at a very low ebb. Practically none of the mines in the Slocan camp, the principal silver-lead mining camp in British Columbia, are producing at the present time, though the Silversmith and a few other mines are keeping development work ahead. Last year the Silversmith shipped 2,500 tons of lead concentrate and 300 tons of clear picked lead sulphide ore, and it has accumulated a large reserve of zinc concentrate, which, owing to unsatisfactory freight-rates to the United States smelters and inability to sell to Trail, the company has been unable to dispose of. A dividend of $25,000 was paid during the last quarter of the year. The new ore-shoot has been developed on the 800, 900, and 1,000 foot levels, and a winze is now being sunk to develop this shoot on the 1,100 and 1,200 levels, and to explore for the continuation at depth of the old Slocan Star shoot, in the opposite direction, from which more than three million dollars worth of ore has been taken. Nearly three-quarters of a million dollars' worth of ore has been taken from the Silversmith shoot. Some 40 men are being employed at this development work.

New York Capital for Cunningham Mines.

Clarence Cunningham, who owns and operates the Queen Bess, and seven other mines in the Slocan district, has recently returned from New York, where he has succeeded in interesting capital in these properties, so it is likely that there will be renewed activity among the Cunningham group of mines in the early spring. The McAlister Mining Company has bonded the McAlister mine, at Carpenter Creek, to W. A. Grimes and associates.

Large Belt of Zinc-Lead Sulphides Uncovered.

Work at the Bellevue group, on the Illiance River, Alice Arm district, which has been continued through the winter, has demonstrated a 40-foot belt of ore over a distance of 2'500 feet. The belt carries a number of stringers and veins ranging from a fraction of an inch up to 8 feet. Some of the small veins are almost clear sulphides of lead and zinc and carry up to 150 ounces of silver and $2.20 in gold per ton. It is thought that it may be possible to crush and concentrate the whole belt of ore.

British Experts Examine Iron and Coal Deposits.

British experts have made an examination of the iron and coal deposits of Copper River district, which are under option to A. C. Garde, of Vancouver. In the event of the British interests acquiring the properties, arrangements have been made with the Provincial Government for a piece of land near Port Edward for the erection of blast furnaces and for a bounty of $3.00 per ton of iron produced from domestic ores and $1.50 per ton of iron produced from foreign ores.

Mining Notes.

With the reduction in cost of labor and supplies, it is probable that there will be more activity in the placer mines of the Cariboo and Northwestern districts of the Province than at any time since the commencement of the war. John Hopp, well-known Cariboo miner, already is repairing sluces, getting out lumber, and making preparations generally for an active season.

The Chu Chua Coal Company is adding to the equipment of its mine, near Kamloops, with a view to increasing the output of the mine from 200 to 500 tons per day.

The Western Fuel Company has closed its Harwood mine, throwing about 200 men out of employment.

The Middlesboro Collieries is adding to its electrical equipment with a view to increasing output.

The Provincial Government has appointed Alexander Henderson, of Vancouver, commissioner to enquire into the cost of coal in the Province. Mr. Henderson has held sessions at Vancouver, Victoria, and Nanaimo; the principal owners, dealers, and many consumers have given evidence. At the time of writing, the commission still is in session.

R. G. Edwards Leckie has secured options on the Columbia and the Excelsior & Eagle groups of claims, on Glacier Creek, eight miles from Stewart. The options specify that considerable development work must be done. W. W. Rush, one of the owners, will superintend the work.

All the machinery for the new concentrator at Stewart, in the Portland Canal district, had been hauled to the mine before the weather broke. The last two boats coming south brought 1,050 tons of high-grade ore to the Tacoma smelter.

BRITISH COLUMBIA INDUSTRIAL NOTES.

THE Provincial Government, through the Department of Industries, has loaned the Douglas Fir Turpentine Company $25,000 at 6 per cent. interest, to assist it in the development of resinous products in the Province. The company provides tools and receptacles to farmers, and pays them 30 cents per gallon for the sap, which is drawn from the trees much in the same way that rubber sap is from rubber-bearing trees. The company's factory is at False Bay, Vancouver, where the sap is distilled and turpentine, flotation oils, balsam, burgundy pitch, Venice turpentine, and soap resins are produced. The sap runs from the trees for about seven months of the year. A good stand of trees is said to produce from 50 to 100 gallons of sap per acre. The company sends launches along the coast to collect and pay for the sap.

To Manufacture Whiting.

The Calcium Carbonate Co., Ltd., has been formed with a capital of $50,000, for the purpose of manufacturing whiting from a deposit of decomposed shell lime in the Kane Valley, near Merritt. The first unit will have a capacity of 10 tons of whiting daily. The deposit is said to contain a very pure carbonate of lime, that requires only to be washed and settled to produce a marketable whiting.

Recommend Oil Drilling.

John A. Dresser and Edmund M. Spieker, who were employed by the Provincial Government to carry on the reconnaisance survey of the oil possibilities of the country around Hudson's Hope, in the Peace River district, commenced by the late J. C. Gwillim, have submitted their report. Like the late Professor Gwillim, Professors Dresser and Spieker found no evidence of oil seepages or other evidence of petroleum in the sandstones and shales of Cretaceous age that occur in the district. They found, however, a number of anticlinal formations suitable for the retention of oil, and they recommend that, rather than the continuation of reconnaisance surveys, the better way to further explore the district would be by actual drilling at points that they name in the report. They point out that the absence of oil seepages have not been uncommon in districts that now are producing oil in commercial quantities, and, considering that the ground can be explored by comparatively shallow drilling they think ex-

ploration by this means would be warranted from the observations that have been made. In making this recommendation they emphasize that it must be born in mind that in the event of finding oil in commercial quantities, owing to the inaccessibility of the district, considerable expense would have to be incurred before the oil could be made available.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

Reported to Canadian Chemistry and Metallurgy by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Process of Desulphurizing Metal Sulphides.
Arthur B. Foster, 209203, March 8, 1921.

Direct Production of Wrought Iron, Steel or Cast Iron.
Lucien P. Basset, 209172, March 8, 1921. Iron ore, coal and flux are introduced at the upper extremity of a rotary furnace which is heated by introducing at the other extremity a finely divided fuel with super-heated air, so that combustion will produce chiefly CO.

Shaped Products and Process of Making Them.
Carleton Ellis, 209629, March 22, 1921. Finely divided fuels or other material are briquetted by mixing with the materials, the solids of waste sulphite liquor and lime and sufficient water to cause a reaction between the liquor solids and lime.

Organic Acid Derivatives.
T. H. Durrans, 209554, March 15, 1921. In making organic acid derivatives Cl and SO_2 are caused to react with a mixture of alkali acetate and a body adapted to promote the reaction, such as an ester, ether, aldehyde, etc.

Iron Composition.
Geo. G. Marx, 209887, March 29, 1921. Iron is produced by melting pig iron, scrap iron and a clay product, such as crushed fire brick.

Process of Manufacturing Steel.
Robert H. Irons, 208998, March 1, 1921.

Treating Fine Ores and Slimes.
Daniel S. McAfee, 209324, March 8, 1921.

Method for the Production of Metallic Tungsten Powder Direct from Sodium and Potassium Tungstates.
Casimir J. Head, 208990, March 1, 1921. Sodium tungstate 100 parts, NH_4Cl 37.01 and charcoal 13.73 parts, are mixed together, gradually heated to 1000° -1150° and the tungsten is separated from the resultant mass.

Process of Roasting Copper Ores.
Percy R. Middleton, 209380, March 8, 1921. Sulphide ores are heated with access of air to a temperature below the ignition point of S, the temperatures maintained till a maximum amount of the sulphide has been converted to sulphate, then increased to about 1200° F., whereby the Fe sulphate is changed to oxide and the Cu sulphide oxidized to sulphate.

Alloys of Manganese.
Bo Michael Kalling and Sven D. Daniel, 209740, March 22, 1921. Manganese alloys low in C and Si are prepared by exposing a manganese alloy comparatively rich in Si at a temperature above the melting point of the alloy to the action of free O.

Fuel for Internal Combustion Engines.
Jno. Flint and F. G. Brown, 209167, March 8, 1921.

Precipitating Organic Substances in the Waste Sulphite Lye.
H. B. Landmark, 209881, March 29, 1921. The sulphonic acid compounds in waste sulphite lyes are decomposed by means of stronger acid under pressure, the stronger acid being produced previously or during the process by oxidation of the SO_2 contained in the liquor, the oxidation being effected by the introduction of air or O into the autoclave and by the discharge of electric sparks therein.

Process of Producing Alumina Poor in Iron.
V. M. Goldschmidt and O. Ravner, 209088, March 1, 1921. Labrodarite is treated with HNO_3 according to the counter-current principle until a neutral nitrate solution is obtained. after filtering, alumina is added to the solution which is kept at 40° to ppt Fe and colloidal silica, the pt is removed, the solution evaporated and the residue calcined to decompose aluminum nitrate and the undecomposed nitrates are removed by lixiviation with water and the solution separated from the undissolved Al_2O_3.

Explosive Compounds.
Chas. M. Stine, 209955, March 29, 1921. Dinitrotolylene nitrate is prepared by chlorinating xylene in sunlight at 100° until an increase in weight corresponding to the formation of the dichlor derivative has been attained, cooling the reaction mixture to obtain crystals of p-$C_6H_4(CH_2Cl)_2$ and filtering off these crystals, nitrating them with HNO_3 and H_2SO_4 until a dinitro derivative is obtained and then heating the nitrated material with pure H_2O under pressure until the Cl has been replaced by OH, then evaporating the solution to drive off H_2O and HCl and obtain $C_6H_2(CH_2OH)_2(NO_2)_2$ in well defined crystals which are further nitrated to produce a powerful explosive.

Composition of Matter for Fire Bricks and Refractory Linings.
Art. F. Quin and Clifford Lacey, 209587, March 22, 1921. The composition consists of mica, six parts; asbestos, six, and NaCl two.

Resistance Alloy.
Jno. H. White, 209342, March 8, 1921. An alloy used in resistance elements contains 75% Ni, 11% Fe and 14% Ta-Cb.

ORGANIZATION OF AMERICAN OIL CHEMISTS.

In May 1920, the Society of Cotton Products Analysts of the United States was reorganized as the American Oil Chemists' Society. Chemists interested in fats, oils, waxes, and allied industries are thus joined for fraternal and scientific business purposes. The membership is not limited beyond a certain period of five years' chemical training. A chemists' section in the "Cotton Oil Press" carries papers and reports of meetings. Mr. H. S. Bailey of the Southern Cotton Oil Co., Savannah, Ga., is editor of the Oil Chemists' Section.

Anyone interested in the activities of this new organization may obtain further information from Mr. Thos. B. Caldwell, Secretary and Treasurer, Wilmington, N.C.

CATALOGUES RECEIVED.

Electric Hydro-Extractors.—Thomas Broadbent & Sons, Limited, Huddersfield, England, have in this catalogue described their well-known makes of Electric Hydro-Extractors. In the Foreword of the catalogue, the following statement appears: "A few years ago our Electric Hydro-Extractor was spoken of as 'the Hydro-Extractor of the future.' It is still that—and more. It is the Hydro-Extractor of the present. Right from its inception it has met with unbounded success. Given the availability of electric power, there is no other type of Hydro-Extractor to equal it." The Broadbent Electric Hydro-Extractor is constructed in eleven sizes and various types. It is in use in many chemical works, dye works, bleach works, finishing works, French cleaning works, laundries, fellmongeries, etc. The catalogue is exceedingly well gotten up, and the different machines illustrated by beautiful half-tone engravings. A feature of these extractors is the complete absence of any complicated mechanism. The electric motor is an inherent part of the machine, and the windings of the motor being specially treated in a patent vacuum impregnating insulating apparatus and enclosed in an iron casting, there is no possibility of their being damaged by damp or oil. Each type of machine occupies only a small amount of floor space. An ingenious device renders unnecessary any complicated starter and resistance. Sole agents in Canada are G. H. Tod Co., 213 Manning Chambers, Toronto.

ROYAL WORCESTER PORCELAIN.

The development of chemical porcelain manufacture in England has been one of the problems in which a good advance has been made and a measure of independence of foreign supply accomplished. The products of Worcester Royal Porcelain Co., Ltd., in comparison with German makes, have stood up well, as illustrated in a catalogue of their goods. Tests of resistance in both sulphuric acid and caustic soda show that losses under exposure are even slightly less in the British make than in some of the best German goods previously supplied the English market.

Chemical, Oil and Metal Markets

The quotations below represent manufacturers' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

SPECIAL REPORT ON ASBESTOS MARKET.

REPORTS from Canadian fields indicate a considerable decrease in mining activity. Little, if any, of this is due to weather conditions, because thus far there has been very little cold weather and the snowfall has been at a minimum. Under such conditions it would be logical to expect a large production, but an analysis of the field indicates that one of the mines has been closed down for quite a time, and the other operators at Thetford and Black Lake are not working full forces or full time.

It is reported to us from all Canadian districts that activities have been generally reduced to a minimum. Canadian producers have learned that over production has in the past been the cause of heavy loss, not only to the mine operators, but all along the line through manufacturers to consumers, and now that the Canadian operators are well equipped financially, it is hardly likely that production will be pressed to the point of flooding the market.

We have some figures as to shipments of crude and fibres during January,, and they are extremely small.

One of the largest operators in Canada is installing a hydraulic plant to remove the over burden from some of its property, and it is predicted that no active production will be had from this new area before the summer of 1923.

Wages have not been reduced at all, and the contract prices remain liberal.

The best information available would indicate no liklihood of a reduction in price for crudes or spinning fibres. There are but two mine operators in the district which have a fair stock of crude in hand, and both of these interests are exceptionally strong financially, and it is extremely unlikely that they will make a cut. There is some accumulation of shorter fibres, but with improvement in the new building operations in the United States the stock in hand will be quickly reduced.

It is pointed out by close observers of the situation that in 1917 and 1918 the asbestos pits were in a bonanza crude formation, whereas now the work has proceeded through this particularly rich ground, and it would be a physical impossibility to extract as much crude and fibre as was obtained in 1917 and 1918.

One observer expresses the opinion that the apparent scarcity of asbestos in 1919 and 1920 was not an actual shortage of material, but was due to railroad adjustments, lack of cars, strikes all along the line and other causes, which impelled American manufacturers to buy everything offered, thus forcing up the price because of what appeared to be an actual shortage of material. As a matter of fact American manufacturers are heavily stocked with crudes and fibres, and quite a few of them are contracted for material considerably beyond their present needs.

If we have a resumption of industrial activity, as is confidently expected on all sides, this condition will not be troublesome; otherwise the manufacturers and the mine operators will have some adjustment to make with respect to unfilled contract commitments

In Arizona a great deal of prospecting goes on and many promising claims have been staked out, some of which are being worked. As a supplement to Canada the Arizona deposits are most valuable, but we are convinced that Canada will continue to dominate world markets considerably beyond our span of life.

In Africa and Rhodesia production is increasing rapidly, and many fields of great promise have not been touched.

For the better qualities of asbestos goods it is extremely doubtful if it will ever be possible for any asbestos now known to displace the predominant position accorded to Thetford stock.

Spinning.

A very greatly improved condition rules in the market for yarns and cloths.

Careful estimators experienced in analyzing the automobile situation are agreed that there is no over-production of cars, and by deduction, prophesy an acute shortage within a few months.

We are inclined to agree with them, and refer doubters to the history of the automobile business through the lean years of 1907 and 1908.

Spinners have been practically inoperative for some weeks, except in steam packings, but we feel sure the next few weeks will mark a great change for the better.

Paper Making.

With building of homes and apartments at a minimum of volume, low-pressure covering is out of luck, and the market for asbestos paper and its products is dull.

On every side can be heard the cry for buildings, and in most sections of the country extraordinary efforts are being made by builders, labor and banks to revive activity. Demand will force an early resumption, and then paper will again be in demand.

Since no reduction in the price of raw stock has been made by producers no material reductions have been made by the manufacturers.

Magnesia Covering.

Great curtailment of active shipbuilding, and the general reluctance of big business to spend money even for necessary extensions and repairs, have caused slackness in demand for maguesia covering.

Shipments made during the last three months of 1920 were much better than expected, in fact, the industry really did a good volume of business, conditions considered.

Resumption of general business will immediately strengthen the demand for coverings, especially if coal prices remain anywhere near present levels.

Magnesia Powder.

Dullness in the rubber trades has cut the demand for carbonate next to nothing.

Supplies of powder in the hands of magnesia makers are low, and improvement in the rubber industry will quickly react on the powder market.

Summary.

The great army of buyers is still on strike. No one seems to be buying anything the purchase of which can possibly be deferred.

This armistice between buyer and seller can last only so long as the buyer's supplies hold out, and then must

come an era of heavy purchasing to replenish the larder, the clothes press, the house, the farm and the conveyance.

Producers and manufacturers are, generally speaking, well provisioned with adequate reserves to withstand a long siege, and, while excessive profits must and will be eliminated, it will be some years before prices are run down to a point below cost of production.

Specifically, the asbestos industry has fared well above the average in the recent adjustment.—From "Asbestos."

GENERAL CHEMICALS.

Conditions in the general chemical market cannot be said to have improved very much during the last few weeks, and, with a few exceptions, buying is still of the hand-to-mouth variety.

Heavy chemicals are more firm, bnt pharmaceutical chemicals are still on the decline, and there is a noticeable drop in the price of bromides, the keynote being imported goods. Bromides are down from 10c to 15c per pound; potassium iodide from 5c to 10c per pound; iodine resublimed, 30c per pound; napthalene flakes, 2c per pound; napthalene balls, 1c; tartaric acid, 10c, and tannic acid, 10c per pound.

Consumers cannot be brought into the market by bargain prices, as they naturally hope for further reductions. There is considerable activity among English merchants and manufacturers, who are freely offering every class of chemical, and it is noticeable that there is a large sprinkling of German goods included in the offers. American houses, however, command most of the business, due to the fact that they give credit, whereas Briitsh houses demany cash against documents, and owing to money tightness importers cannot meet heavy shipments on these terms.

There is some activity in the rubber trade, and a number of the rubber companies are now working to full capacity.

The inquiries for paint materials have been considerably better, which is only natural, as the manufacturers are now getting ready for the season's goods, and there is every reason to believe that they will be working to full capacity during the next few weeks.

OILS.

The oil market forms one of the most interesting spectacles at the present time in the market world. The drop in prices in crudes, fuel oil and gasoline which occurred during February was a remarkable decline for such a stable product as oil, and was due simply to poor demand, and occasioned in turn, no doubt, by the lack of financial means to buy. At the beginning of April we still find these low prices maintained, with the exception of fuel oil, which has dropped off a cent. The prospects are that before the end of April an advance in prices will occur. Already a stiffening to the market is noted, and the consumer who failed to take advantage of the low prices during March and the first part of April will have something to regret.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals.

Inorganic.

Alum, Ammonia, lump and ground..100 Lbs	5.50— 6.00
Ammonium Bromide ....Lb.	.. — .54
Aluminium Sulphate, high grade, bags.100 Lbs.	. — 4.75
Ammonia, Aqua 26 ....Lb.	.11— .12
Ammonium Carbonate ....Lb.	.16— .20
Ammonium Chloride ....Lb.	.15— .20
Ammonia Iodide ....Lb.	.. — 6.30
Arsenic . ...Lb.	.. — .14
Barium Sulphate (Barytes) ....Per Ton	30.00—35.00
Barium Chloride ....Lb.	.05—.07½
Barium Nitrate ....Lb.	.. — .20
Barium Sulphate, B.P. ....Per Ton	100.00—110.00
Battery Acid, up to and including 1.400 sp. gr. . ...Cwt.	3.00— 3.50
Battery Acid, over 1.400, up to and including 1.835 sp. gr. ....Cwt.	3.50— 4.00
Bleaching Powder, 35% drums ......100 Lbs.	.05—.05½
Borax, crystals ....Lb.	.09¾— .10
Boric Acid, powdered ....Lb.	.. —.18½
Calcium Carbide, car lots, f.o.b. works...Ton	.. —100.00
Calcium Carbide, ton lots, f.o.b. works..Ton	.. —105.00
Calcium Carbide, less than ton lots, f.o.b. works . ...Ton	.. —110.00
Caustic Soda, ground, drum ....Lb.	.06—.06½
Caustic Soda, solid, drum ....Lb.	.05¼—.05¾
Calcium Chloride, fused ....Per Ton	58.00—60.00
Camphor Monobromate ....Lb.	.. — 3.00
Carbon Bisulphide, in drums ....100 Lb.	.. — .10
Carbon tetrachloride, drums ....Lb.	.18— .20
Chalk, Precipitated ....Lb.	.04¼— .06
China Clay, imported ....Per Ton	35.00—45.00
Cobalt Oxide, black ....Lb.	.. — 3.30
Cobalt Oxide, grey ....Lb.	.. — 3.60
Copperas (Iron Sulphate) crystals ....Lb.	.. —.02¼
Copperas (Iron Sulphate) sugar ....Lb.	.. —.02¼
Copper Sulphate (Blue Vitriol) ....Lb.	.08—.08½
Corosive Sublimate (Mercuric Chloride)..Lb.	.. — 1.45
Fluorspar, ground ....Tons	.. —30.00
Fuller's Earth, powdered ....100 Lbs.	2.00— 2.50
Fuller's Earth, car lots, f.o.b. Toronto ..Ton	35.00—40.00
Ferric Chloride, crystals ....Lb.	.14— .15
Ferric Chloride, solution ....Lb.	.. — .12
Hydrofluoric Acid, 60% ....Lb.	.. — .30
Hydrofluoric Acid, 30% ....Lb.	.. — .14
Hydrochloric Acid, carboys, 18 ......100 Lbs.	2.75— 3.00
Hydrogen Peroxide ....Gal.	.. — 1.05
Iodine, crude ....Lb.	.. — 4.75
Iodine, resublimed ....Lb.	.. — 5.20
Lead Acetate ....Lb.	.18— .19
Lead Nitrate ....Lb.	.16— .18
Lithopone . ...Lb.	.09½—.10½
Magnesite, calcined ....Per Ton	.. —25.00
Magnesite, clinkered ....Per Ton	.. —35.00
Magnesite, raw ....Per Ton	.. —10.00
Magnesium Carbonate, bbl. ....Lb.	..18— .20
Magnesium Sulphate ....Lb.	.04— .05
Mag. Sulphate, B.P., Medicinal...Single Ton	70.00—75.00
Mag. Sulphate, Technical, car lots ......Ton	55.00—60.00
Muriatic Acid, 18 ....100 Lb.	2.75— 3.00
Nitric Acid, 36 carboys ....100 Lb.	.09—.09¼
Phosphoric Acid, 85% ....Lb.	.43— .50
Phosphoric Acid, 50% ....Lb.	.29— .31
Potassium Bicarbonate ....Lb.	.. — .41
Potassium, Bromide, crystals ....Lb.	.. — .50
Potassium, Bromide, granular ....Lb.	.. — .50
Potassium Bichromate ....Lb.	.. — .35
Potassium Chloride ....Lb.	.. — ..
Potassium Carbonate, calc. 80%-85% ......Lb.	.. — ..
Potassium Chlorate ....Lb.	.. — .18
Potassium Citrate ....Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots	.. —.14½
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots	.30— .35
Potassium Hydroxide (Caustic Potash).Sticks	.. — .80
Potassium Iodide ....Lb.	3.95— 4.00
Potassium Nitrate, kegs ....Lb.	.18— .20
Potassium Permanganate, bulk ....Lb.	.65— .70
Red Precipitate (Mercuric Oxide) ....Lb.	.. — 2.50
Silver Nitrate ....Lb.	.. —10.00
Soda Ash, bags ....Lb.	.03—.03¼
Sodium Acetate, ton lots or over ....Lb.	.. —.08¼
Sodium Acetate, lesser amounts ....Lb.	.. — .15
Sodium Benzoate ....Lb.	.80— .85
Sodium Bicarbonate, 100% pure ......100 Lb.	3.85— 4.00
Sodium, Bichromate, bbls. ....Lb.	.12— .14
Sodium Bisulphite, powder ....Lb.	.. —.09½
Sodium Bisulphite, 35 ....Lb.	.05½— .06
Sodium Cyanide, bulk, 98-99%, in cases...Lb.	.. — .28
Sodium Hyposulphite, kegs ....100 Lb.	5.00— 5.75
Sodium Nitrate, refined ....100 Lbs.	7.00— 8.00
Sodium Nitrate, crude, 95% ....100 Lbs.	5.00— 5.75
Sodium Nitrite ....Lb.	15— .16
Sodium Silicate, according to density.100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals ....Per Cwt. in Bags	.. — 2.25
.......................Per Cwt. in Car Lots	.. — 2.00
Sodium Sulphite ....Lb.	.. — .07
Sodium Prussiate, Yellow ....Lb.	.22— .27
Sulphur, ground ....100 Lb.	2.75— 3.00
Sulphur, roll ....100 Lb.	4.50— 4.75
Sulphuric Acid, 66 Be, carboys........100 Lb.	2.50— 3.00
Sulphuric Acid, 66 Be, tank cars	.. 21.00

Talc, No. 1 grade	Ton	.. —30.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	.. —18.00
Tin Chloride, crystals	Lb.	.40— .45
Tri-sodium Phosphate	Lb.	.08¼—.08½
Ultramarine, Blue	Lb.	.20— .50
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting (English)	Ton	.. —40.00
Whiting (American)	Ton	.. —35.00
Whiting	Per Ton	35.00—40.00
Zinc Sulphate, com.	Lb.	.05¾—.06½
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.13— .15
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.. — .55
Acetic Acid, 28%, carload lots	Lb.	.. —.04½
Acetic Acid, 28%, 25 bbl. lots	Lb.	.. —.05¼
Acetic Acid, 28%, 15 bbl. lots	Lb.	.. —.05½
Acetic Acid, 28%, 10 bbl. lots	Lb.	.. —.05¾
Acetic Acid, 28%, 5 bbl. lots	Cwt.	.. — 5.85
Acetic Acid, 28%, 3 or 4 bbl. lots	Cwt.	.. — 5.90
Acetic Acid 28%, 1 or 2 bbl. lots	Lb.	.. — .06
Acetic Acid, 80%, carload lots	Lb.	.. — .12
Acetic Acid, 80%, 25 bbl. lots	Lb.	.. — .14
Acetic Acid, 80%, 15 bbl. lots	Lb.	.. — .15
Acetic Acid, 80%, 10 bbl. lots	Lb.	.. —.15½
Acetic Acid, 80%, 5 bbl. lots	Lb.	.. — .16
Acetic Acid, 80%, 3 or 4 bbl. lots	Lb.	.. —.16½
Acetic Acid, 80%, 1 or 2 bbl. lots	Lb.	.. — .17
Acetone, pure, drums or over	Lb.	.. —.19¼
Acetone, pure, lesser amounts	Lb.	.. — .25
Aspirin, in 100-lb. lots	Lb.	.90— 1.05
Alcohol, Absolute Ethyl, case of 1 doz 1-lb bottle	1-lb. bottle	.. — 2.15
Alcohol, Absolute Ethyl, in steel drums of 10 gallons capacity	Imp. Gal.	.. —15.00
Alcohol, acetone, bbls. or over	Gal.	.. — 1.40
Alcohol, acetone, lesser amounts	Gal.	.. — 1.70
Alcohol, pure, bbl., 65% O.P.	Gal.	.. —10.50
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 1.15
Alcohol, wood, 95%, half bbl. lots	Gal.	.. — 1.25
Alcohol, wood, 95%, lesser amounts	Gal.	.. — 1.30
Alcohol, wood, 97%, bbls.	Gal.	.. — 1.78
Alcohol, wood, 97%, half bbl. lots	Gal.	.. — 1.90
Alcohol, wood, 97%, lesser amounts	Gal.	.. — 2.05
Amyl acetate, technical	Gal.	4.75— 5.25
Amyl acetate, pure	Gal.	5.75— 6.25
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — 1.25
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 1.60
Carbolic Acid, white crystals	Lb.	.. — .30
Chloroform	Lb.	.57— .75
Citric Acid, domestic, crystals	Lb.	.. — .70
Coumarin	Lb.	.. — 5.50
Cream Tartar, 98%	Lb.	.45— .55
Dextrine	Lb.	.. — .09
Ether, Sulphuric	Lb.	.35— .50
Formaldehyde, bbls. or over	Lb.	.. — .25
Formaldehyde, 200-lb. kegs	Lb.	.. — .28
Formaldehyde, 100-lb. kegs	Lb.	.. — .29
Formaldehyde, 50-lb. kegs	Lb.	.. — .30
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Gallic Acid	Lb.	1.25— 1.75
Glycerine, C.P., single tin of 56 lbs.	Lb.	.. — .31
Glycerine, C.P., two or more tins	Lb.	.. — .29
Glycerine (pale straw) single tin 56 lbs.	Lb.	.. — .30
Glycerine (pale straw) two or more tins	Lb.	.. — .28
Hexamethylenetetramine		1.10— 1.50
Oxalic Acid	Lb.	.25— .30
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.50
Phenolphthalein	Lb.	.. — 2.10
Pyrogallic Acid	Lb.	3.00— 3.50
Quinine	Oz.	1.00— 1.10
Saccharin	Lb.	4.50— 5.00
Salicylic Acid	Lb.	.40— .45
Stearic Acid, Double Pressed	Lb.	.23— .27
Stearic Acid, Triple Pressed	Lb.	.26— .30
Tartaric Acid, crystals or powdered	Lb.	.40— .45
Tannic Acid, commercial	Lb.	.. — .50

Rubber.

The following quotations on rubber are in American funds, New York delivery:

Crude.

Para, upriver	Lb.	.. — .18
Caucho Ball, upriver	Lb.	.. — .15

Plantation Rubber.

1st Latex Crepe	Lb.	.. — .19
Smoked Sheet	Lb.	.. —.18½

Scrap Rubber.

Boots and shoes	Lb.	.04— .05
Automobile tires	Lb.	.. — .01
Steam and fire hose	Lb.	.. —.01¼
Inner tubes, No. 1	Lb.	.. — .08
Inner tubes, No. 2	Lb.	.. —.05¾

Tanning and Dyeing Materials

Fustic Crystals	Lb.	.30— .35
Hematine Crystals	Lb.	.25— .28
Logwood Crystals	Lb.	.34— .36
Quercitron Liquid Extract	Lb.	.09— .10
Liquid Sumac Extract	Lb.	.07— .08
Ground Sumac	Ton	75.00—85.00
Chestnut Liquid Extract	Lb.	.03½— .04
Hemlock Liquid Extract	Lb.	.06— .07
Quebracho Liquid Extract	Lb.	.05½— .06
Quebracho Solid Extract	Lb.	.07—.07½
Liquid Blended Extract (Canadian)	Lb.	.04¾—.05¼

Metals.

Aluminium, No. 1, 98-99%	Lb.	.. — .29
Antimony	Lb.	.. —.08¼
Brass, yellow ingots	Lb.	.. — .16
Brass, red	Lb.	.. — .18
Cobalt, metal	Lb.	.. — 4.50
Copper, electrolytic, small lots	Cwt.	.. —16.75
Copper, electrolytic, car lots	Cwt	.. —16.25
Copper, casting, small lots	Cwt.	.. —15.75
Copper, casting, car lots	Cwt.	.. —15.25
Gold, Pure	Oz.	23.00—25.00
Iron, Pig	Ton	.. —43.00
Lead, pig, small lots	Cwt.	.. — 5.95
Lead, pig, car lots	Cwt.	.. — 5.45
Magnesium, ribbon	Lb.	.. —18.00
Magnesium, powder	Lb.	3.00— 3.50
Mercury	Lb.	.. — 2.50
Nickel, shot or ingot	Lb.	.. — .40
Platinum, pure	Oz.	85.00—90.00
Silver, bar, American silver	Oz.	.. —.99½
Silver, bar, Canadian produced, U.S. funds	Oz.	.. —.58½
Steel, mild, ¼ inch, base price	Cwt.	.. — 5.75
Steel, mild, 3/16 inch, base price	Cwt.	.. — 6.25
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	8.15— 8.50
Tin	Lb.	.. — .36
Zinc, sheets	Lb.	.. — .25
Zinc (spelter) small lots	Cwt.	.. — 6.95
Zinc (spelter) car lots	Cwt.	.. — 6.45

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .38
Motor Gasoline (service stations)	Gal.	.. — .42
Lighting Gasoline	Gal.	.. — .47
Naphtha	Gal.	.. — .37
Coal Oil	Gal.	.. — .27
Fuel Oil	Gal.	.. —.08¼
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 1.75
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 3.00
Crude Creosote Oils, bbls.	Gal.	.. — .40
Refined Creosote Oil, bbls.	Gal.	.. — .55
Crude Coal Tar	Bbl.	.. — 9.20
Refined Coal Tar	Bbl.	.. —10.50
Coal Tar Pitch, bbls.	Cwt.	.. — 1.90
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52— .57
Dip Oil, 20 per cent.	Gal.	.38— .48
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .10
Naphthalin Balls	Lb.	.. — .11
Alpha-Naphthylamin	Lb.	.. — .51

Flotation Oils and Naval Stores.

Spirits of Turpentine, in bbl. lots	(Imp.) Gal.	.. — .90
Rosin, Grade G, in 280 bbl. lots		.. —10.00
Rosin, Grade W.W., in 280 bbl. lots		.. —10.50

Gums and Vegetable Oils.

Vegetable Oils—

Anise Oil	Lb.	2.10— 2.25
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .21
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .19
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.30— .32
Linseed Oil, raw, in bbl. lots	(Imp.) Gal.	.. — .85
Linseed Oil, boiled, in bbl. lots	(Imp.) Gal.	.. — .88
Monopole Oil	Lb.	.. — .30

Gums—

Indian, No. 1A	Lb.	.. — .40
Indian, No. 1	Lb.	.. — .38
Tragacanth, No. 1, Ribbon	Lb.	.. — 4.50
Tragacanth, No. 1, Flake	Lb.	.. — 3.60
Tragacanth, Turkey	Lb.	.. — 3.75
Arabic, clear amber sorts	Lb.	.. — .18
Arabic, regular grain No. 4 and No. 6	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22¼
Arabic, white sorts	Lb.	.. — .40
Arabic, powdered, No. 1	Lb.	.. — .25
Arabic, powdered, No. 2	Lb.	.. — .24

Fertilizer Materials

Animal Tankage, per unit of Ammonia		7.00— 7.50
Animal Tankage, per unit of Bone Phosphate of lime		.. — .10
Nitrate of Soda	Ton	100.00—105.00
Muriate of Potash	Cwt.	7.00— 7.60
Pure Ground Blood, per unit of Ammonia		6.50— 7.00
Steamed Bone Meal	Per Ton	65.00—70.00

C. P. Chemicals.

Ammonia, C.P.	Lb.	.. — .26
Hydrochloric Acid, C.P.	Lb.	.. — .15
Nitric Acid, C.P.	Lb.	.. — .23
Sulphuric Acid, C.P.	Lb.	.. — .14

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CANADIAN CHEMISTRY AND METALLURGY

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EDITORIALS

PROGRESS OF THE INSTITUTE

THE perplexity of the general professional situation among Canadian Chemists is not decreasing. We have had so many changes and developments within the past two or three years that it is small wonder that some chemists are unable to keep up with the various movements. A year or more should see established the lines upon which we are to proceed for some time.

The Institute of Chemistry has been working its organization into shape rather slowly, but along very broad and comprehensive lines. It is the one professional organization of chemists linking up all provinces. There is still some confusion and misunderstanding existing with regard to the present organization of sections of the Society of Chemical Industry. Independent sections dealing directly with the Council in England now exist at Shawinigan Falls, Montreal, Ottawa, Toronto and Vancouver. There is no Canadian council representing these sections although machinery has been proposed whereby the secretaries and chairmen will form such a council presided over eventually by a vice president of the society. From the industrial angle this would be very desirable. The Manitoba Chemical Society has been active during the past year and the Maritime Chemists Association holds annual meetings.

Last of all has come the Ontario Association of Professional Chemists whose only purpose is to secure legislation under Bill 208 relating to "Professional Engineering," in the Province of Ontario. The question of joining with the engineering profession in this way has been debated and objections have been expressed from various angles. Some are not in favor of this type of legislation in any case. Others believe that the chemists should stand alone and make some effort to secure legislation for themselves if found desirable. The great majority, however, in Ontario, are strongly in favor of the movement as the recent vote taken would indicate, and it is unlikely that anything done will lessen the common interests of all Canadian Chemists.

As for the Institute, it still remains the leading Canadian body of Professional chemists. It has faced difficulties never solved by any other society of chemists here, and has given Canada a National Professional Institute. A council, scattered from Halifax to Vancouver, has had the task of building up from nothing, a complete organization with suitable regulations and charter. This task is entering the last stage of completion and it is most probable that at the next annual meeting of the Institute in August, a complete organization will be presented to the members.

What follows then? We take it that the Institute can begin through its branches, the real work for which it was created. As a start along this line, a branch has been established at Kingston where no previous chemical organization of the kind existed. The younger men are being given an opportunity to hear others discuss problems relating to the profession. A professional meeting is to be held in Toronto on May 13th. From the program proposed it is evident that the Institute intends to take its chemistry seriously. Something of the old spirit which drew men to meetings of chemical Societies in England years ago may yet be attained. In those days there was certain to be something given that was well worth while hearing because it was new. If the meetings of the Canadian Institute develop along these lines they will attract the profession at large. In Canada there is a great need for professional fellowship. Men outside the largest cities have few opportunities to discuss chemistry with members of their profession, and an isolated chemist certainly needs regular professional injections. While the future of the Institute will probably allow for a greater interest and representation in chemical affairs outside the Dominion, it is certain it's success will mean a new stimulus to chemical progress within, and the advance of research in our universities and industries. Perhaps a noble aim within its scope will be the development of a national chemical voice playing a proper part in the affairs of our country.

LA VEUVE CURIE

PERHAPS no single, material, discovery has so deeply affected the world of science and commerce, of therapeutics, thought, literature, and fakedom as that of radium. The millions of watches on the wrists of officers and soldiers waiting for the zero hour; the quick diagnosis of broken bones; the positive and practically painless probing for bullets and shrapnel splinters; made history and saved lives through those dark four years. Well does Glenn Frank in the May "Century" call Madame Curie the "Jeanne D'Arc of the laboratory"—and she will go back from her Radium Rheims to the Domremy of her quiet professorship at the Sorbonne with all the unaffected simplicity

of that Jeanne of glorious memory, one of the truly great.

SURPRISING OMISSIONS

"HIGH School Inspectors, Principals, and Teachers at the Ontario Educational Association yesterday were united in praise of the radical revision of the curriculum proposed by the Provincial Committee on High School Education.—"Toronto Globe," March 31, 1921.

And THIS is what they recommended: that the obligatory subjects be, English (Literature and Composition), Physiography, Canadian History, and Algebra or Geometry. Latin, Greek, French and other subjects to be optional

For a complete exemplification of being all dressed up and nowhere to go, we would have to wait for the students leaving high school on such a regimen. Single track, narrow gauge, lacking in terminal facilities—to dilate on Mr. Cobb's simile—such would be the mind we might expect to meet.

The students are considered only as the objects of pedagogic endeavour.

It is noted that the subjects mentioned are only those that might be considered as the tools for handling matter. Even the optional subjects referred to off-hand include only abstract lines of study.

It is quite evident that we still have the administrative educationists fumbling in the fog left by the old fogeys.

From the cradle to the coffin lid we have to deal with matter—eat it, drink it, breathe it, stand on it, sit on it. It keeps us well, it makes us sick, it keeps us alive, and it kills us, BUT, as far as pedagogy is concerned, it doesn't exist. Why arithmetic? Why algebra? Why geometry? Without matter what are they? Children don't play with letters, words or numbers. Fondly we put letters and digits on blocks, but the blocks are built into houses, towers, railroad stations, anything, and in any order, utterly irrespective of words or numerical succession.

One well known school inspector did submit a suggested high school curriculum of four years with chemistry included in the third year, and physics in the fourth, when any teacher of chemistry knows that you cannot teach chemistry with out some foundation of physics. The kindergarten could well be followed by the elements of colour, light, sound, chemistry and botany as exemplified in the activities of child life, wherein water, sand, mud, fruit, candy—no, that's supposed to be taboo—tin trumpets, drums, trolley-cars, engine-whistles—all suggest but one thing to the child—why? until his parents are frantic with evasions and surreptitious appeals to the encyclopædia—while the teacher goes on serenely with letters, digits, pot hooks and hangers.

NEXT!

A CONNECTICUT "expert in chemistry" has a new alibi for defeated athletes. Even if your best half-backs are there and your full team out, no one injured, the signals given and taken like clockwork, you may have to knuckle under because your team has been brought up on a deficient soil.

Henceforth far-sighted coaches will analyze the soil upon which their team is grown and examine the antecedents of aspiring stroke oars, quarter-backs, and rovers in respect to soil conditions.

As reported in the New York Times, April 11th—

> "Plants make use of thirteen chemical elements, and the chief two are nitrogen and lime. These are exhausted in the Connecticut, and to quite an extent in the Massachusetts soil. By supplying them the soil can be restored to fertility and production."

We had always thought that carbon, hydrogen and oxygen, were used to considerable extent by plants.

In another part of the "Times" reported interview is this prophecy—

> "If the athletes now training for Yale teams could be fed the proper legumes, there is no doubt Yale could regain her athletic supremacy."

Beware, Toronto—McGill, Hamilton, Ottawa, and Queen's, Macdonald College, and the O.A.C. will get you on the leguminous hip if you don't watch out. Let your slogan be "Vitamines and Victory," and "Legumes for the Leggers."

CHEMICAL PUBLICITY AGENTS

WE certainly need something designed to discount some very popular misconceptions. To some this may seem impossible, but it is more real than you think. There are companies that know not the chemist and in all seriousness, fear that his advent in their plant would be a positive injury to their business. Besides the classic example of the company that did not want a chemist around their vinegar factory because people might suspect that they were putting chemicals in their vinegar, there are firms manufacturing confectionery, candies, and even bread, who act as if this was their belief also.

The laundry business has the greatest difficulty in persuading the public that they do not use injurious chemicals. Ladies insist that the laundry "uses chemicals," and so they do. It is pleasing to note that some educational work is being done to explode the idea that "all chemicals" are injurious. One laundry came back with the argument that they use the same chemicals which

ladies eat in biscuits. There is more free acid in a salad dressing than most acid solutions used in laundries. A little educational work is what is needed to make people more receptive to the work of the chemist. and the lack of it is hindering his progress in many industries. If industries using "chemicals" would employ chemists they would have less difficulty with the public, and, generally speaking, make more money.

GOLD PROSPECTS IN ONTARIO

ONTARIO seems certain to maintain her position as a leading mineral producing province. While the demand for some of her metals has not been good and has made it necessary to reduce operations in the silver mines in particular, she is entering upon a great production of gold.

This is reflected in the rapid advance of stocks of producing companies. Northern Ontario undoubtedly contains gold properties which, if we are not mistaken, will set world records which will be difficult to beat. While much must remain speculation until discoveries are made, it seems reasonable to think that development work in other places will reveal further ore bodies equivalent to these now known. We can vision a time when railroad facilities will be serving not only one Cobalt and one Porcupine, but possibly several. While other mining interests had fair sailing during the war, the gold producers were not so favored, and it is some pleasure to note their present evident signs of prosperity.

It is even not beyond reason that Canadian production may come up very shortly to that of the United States. In 1920 a recovery of $59,000,000 was obtained in the United States and the estimate for Northern Ontario this year is around $22,000.-000.

FOOD STANDARD REGULATIONS

THE Dominion Government through its Department of Health has prepared a very serviceable little pamphlet which will be found useful to many manufacturers. The regulations of food and drug inspection and Canadian standards are set forth. This work was developed for the most part under the direction of Dr. A. McGill during the period when this branch was under the wing of the Inland Revenue Department.

Now that the Department of Health has absorbed the laboratories of the Inland Revenue Department, it is not unlikely that some new fields will be opened up in standards. The creation of standards is something that follows developments in medicine, chemistry and studies of diets, and to some extent must bear in mind popular tastes, methods of manufacturing and transportation problems. The public interest needs protection both from undue exploitation of patent articles, fraudulent advertising, and impure and harmful food products. There must be a final appeal somewhere, and the duties of those who guide government decisions call for mature judgment and some strength of action.

If standards lag behind the desire of a few, they generally meet with the disapproval of many more. The Government is to be recommended for what they have done in the matter of labelling, but there is still a good distance to go.

ACKNOWLEDGMENT.

WE have received and read with pleasure a very neatly printed booklet, called "The Gray Terror," written by Mr. A. L. Dawe, Secretary of the Canadian Pulp and Paper Association. It emphasizes in a clever little story the value of paper, describing the disaster that came to a community through the sudden destruction of paper due to the escape of a certain war gas in the air in heavy weather.

The gas had been in storage and had been made innocuous to living tissue, but was destructive to cellulose. Money, ledgers, parcel room checks, wrappings and insulating material all went at once.

The fact that it was all a smoking room dream is neatly brought out at last. Mr. Dawe does not say why furniture, woodwork and clothing did not also go, but it is not of the essence of dreams to be too circumstantial.

We offer our congratulations to Mr. Dawe upon his entry into the short story field.

ACTION vs. TALK.

THE Canadian Pulp and Paper Association has decided to embark on research.

A representative committee after considering the matter for a year reported two recommendations; one, that the Association start research work, and; two, that at present no laboratory arrangement be considered, and their recommendations were adopted. Further, at the same meeting the Association heartily endorsed the proposed legislation of the Honorary Advisory Council on Research. This appeals to us: first, a willingness of the industry to go ahead on its own with means at hand, and second, an appreciation of the value of more elaborate equipment.

A good step in progress is often prevented by well meaning enthusiasts who advocate something undoubtedly better, but not presently possible.

In deciding to appoint a director of research, the pulp and paper industry has inaugurated work that would have to be done whether laboratory equipment were available or not, that is take an inventory of problems and the work done towards

their solution. Thus advancing the better step possible rather than halting for the best.

Many paper and pulp mills have good technical staffs which have done excellent work, much of it in control of operations which could in no case be carried on in any other place than a mill.

Many other mills have no such staffs and things are done which would not be done in a laboratory, because the men in charge are free from the limitations of the scientific view. If all these could be brought under careful observation much important, expensive, and erratic operation might be recorded.

We are not advocating the introduction of happy-go-luckyness into research, but we believe that much useful information is lost because the results of work undertaken from the deductions of practical men free from the academic bias are not brought under scientific appraisal.

Many industrial problems would be solved by correct observation, and record of plant conditions, such as temperature, humidity, ventilation, power conditions, moisture contents, and other comparatively simple and inexpensive routine determinations. Properly related, tabulated and plotted.

A necessary and valuable work in research could thus be inaugurated by co-operation of the mills with a small, but active, bureau with practically no laboratory equipment other than files and brains.

The Pulp and Paper Association of Canada has shown wisdom in deciding to act on personnel first with expansion as circumstances warrant, rather than talk in a large way of physical equipment and do nothing. We hope other industries will do likewise, thus getting into shape a great mass of valuable data on problems that will come before the National Research Institute.

BIG BONFIRE IN PROSPECT ?

POSSIBLY not, in these days of conservation. Those school chemistries can be boiled up with a little NaOH, be made up into nice clean unlettered paper and start all over again a few pegs higher; as least it looks as if we were approaching that line of action.

This is what crossed our mind when we read Dr. Irving Langmuir's address at the tenth anniversary meeting of the Chemist's Club, March 17th.

Dr. Langmuir—and soon we shall not say Doctor Irving Langmuir, or Doctor Langmuir, but just Langmuir, as we do with the other Olympians—hinted at the early advent of a deductive chemistry in place of the present empirical hit-or-missive-hodge-podgeic style.

The new method will be based on the structure of the atom, so that we can card-index it mentally. It will be more fascinating than chess—and will be carried on like the new bookcases—complete at the start, but capable of extension at any time as demanded by circumstance.

A VIEWPOINT.

OUR chemist is an awful slob.
He boils up stuff in a glass, by gob.
He sticks out his stomach an' looks down his nose,
At a long toob of glass an' then he blows
Down another glass toob with a bubble or knob,
Or somethin' or other, an' picks up a swab,
An' swabs out a toob, an' pours in some dope
That smells like the devil an' suds up like soap.
Other ways he's quite a decent old boob;
That's when he ain't peekin' in at a toob.

—H. TWO S.

If this is what the public thinks about you, what are you doing to alter the attitude?

BILL 208.

BILL 208 before the Ontario Legislature, being an Act respecting Professional Engineers, has been definitely held over for this year. The Bill was introduced rather late in the session, and, along with a considerable amount of unfinished business will come up for consideration in committee sometime before the Ontario House meets again.

Under this act "Professional Engineering" was defined in a way which would include the activities of chemists and chemical engineers. The Bill will be definitely introduced and dealt with during the next meeting of the Ontario Legislature.

DEATH OF J. W. LEITCH.

The death occurred, April 10th, at Huddersfield, England, of John Walker Leitch, governing director of the well known firm of John W. Leitch & Company, Limited, Millsbridge Chemical Works, Huddersfield, England, manufacturing chemists. The late Mr. Leitch was the founder of the business which has grown up under his direction during the last thirty years. His loss to the business and to the English chemical industry will be regretted by a great many business acquaintances.

PERSONAL.

Dr. Paul E. Klopsteg, who has been connected with the Sales and Advertising Department of Leeds and Northrup for several years, has recently accepted a position with the Central Scientific Company of Chicago, as Manager of Development and Manufacturing.

APPOINTED OFFICIAL CHEMISTS.

Messrs. J. T. Donald & Co., Limited, chemical engineers, Montreal and Toronto, have been appointed official chemists to the Quebec Liquor Commission. This is the commission appointed to handle the new Government Control Act in Quebec province.

MANUFACTURE OF PHOSPHORUS PRODUCTS IN CANADA*

Historical Sketch of the Industry—Fertilizer Works—Phosphorus Works—Basic Slag

By HUGH S. SPENCE.

THE manufacture of phosphatic fertilizers in Canada, and the utilization of domestic apatite for such purpose, dates from about the year 1869. In that year Messrs. Cowan and Robertson established the Brockville Chemical and Superphosphate Company, near the town of that name in Leeds County, Ontario; the works continuing in operation until the early nineties. In 1887 the Standard Fertilizer and Chemical Company was formed, with a small plant at Smith's Falls, Ontario; and this concern still produces small quantities of acid phosphate and fertilizer. In 1889 the manufacture of superphosphate was commenced at Capelton, Quebec, where G. H. Nichols and Company installed a plant for the production of fertilizer, utilizing acid prepared from the sulphide ores of their mines at the same place. The works were in operation for some years, but the manufacture appears to have been discontinued about the year 1902. In the late eighties and nineties three apatite grinding mills were in operation at Buckingham, Que., the nearest railway shipping point to the Lièvre River mines.

One of the plants, that of the Lièvre Basin Phosphate Mining and Milling Co. (F. S. Shirley), was located at Bassin du Lièvre, close to Buckingham Station, and was run by turbine, power being derived from the falls of the Lièvre River close by. The mill contained a cylindrical dryer, with automatic conveyer to a crusher and pulverizer, from which the mineral passed to an 80-mesh screen, and then to bags. The plant was only a small one, with a capacity of 25 tons per diem; and although phosphate from various mines was ground, producers still continued to ship practically all their mineral in the rough.

Another mill was that of Messrs. Lohmer, Rohr and Company, of Montreal, who also erected a plant at Buckingham, about the year 1890. This plant had a capacity of 50 tons per diem, and employed about 25 men. The machinery comprised rotary dryers, crushers, pulverizers, trommels, screens, etc., the finely ground mineral being air-floated.

A third plant, with a small capacity of under 10 tons per diem, was operated by the Canadian Phosphate Company, who milled a portion of the mineral derived from their own Crown Hill and Star Hill mines. With the closing down of the larger mines in the Lièvre River district, work at all these mills was discontinued a few years after their erection.

The total quantity of phosphate crushed at Buckingham in the year 1888 amounted to 1,625 tons. Practically the whole of this amount was shipped to Chicago, while the total of crude rock phosphate shipped to Montreal for transport to Europe during the same period was 14,725 tons.

In 1897 the Electric Reduction Company erected a plant at Buckingham, and commenced the manufacture of phosphorus from high-grade apatite, subsequently enlarging their plant and producing, in addition, ferro-phosphorus, ferro-silicon and ferro-chromium.

In 1902 the Nichols Chemical Company discontinued the preparation of superphosphate at their works at Capelton, and in the following year a new firm, the Capelton Fertilizer and Chemical Company, was formed to undertake the manufacture, at Masson, near Buckingham, of acid phosphate and complete fertilizers. Neither the last-named concern nor the Electric Reduction Company at present consumes any large quantity of domestic apatite, both firms of late years importing almost their entire supply of crude mineral from Florida.

The firms enumerated above comprise those domestic concerns which have at various times utilized Canadian apatite for the manufacture of phosphorus products.

The present state of the Canadian apatite mining industry is evident when, as noted above, two important consumers of phosphate rock, with works located within a few miles of the apatite mines, find it cheaper to import their entire supply of raw material from the Southern United States than to purchase domestic apatite.

In addition to the above-mentioned companies which, originally at least, constituted a domestic market for Canadian apatite, a number of fertilizer works using phosphate materials have been established in recent years, many of them in connection with packing houses and similar businesses. These factories, however, employ, almost exclusively, prepared acid phosphate imported from the United States. The more important of such works are the following:

Fertilizer Factories—Alberta.

Swift Canadian Co., Edmonton.—Manufacture ammoniates only. Dry mixing plant, without rock grinding or acidulating equipment. Use imported acid phosphate.

British Columbia.

Victoria Chemical Co., Ltd., Victoria.—Complete fertilizer plant, with acid chambers. Use bone char from sugar refineries as raw material for acid phosphate, as well as phosphate rock imported from Idaho.

New Brunswick.

Provincial Chemical Fertilizer Co., Ltd., St. John.—These works were established as an acidulating plant in 1889. For a number of years past, however, prepared acid phosphate has been imported from the United States. The works are situated at Little River, East St. John, and have a capacity of 5,000 tons of mixed fertilizer per annum. Large quantities of tankage, bones, fish scrap and abattoir refuse are used. The acid phosphate is brought to the works by schooner, the plant being located on tide water. The market for the finished product is chiefly among the potato and fruit growers of the St. John district.

Dominion Fertilizer Co., Ltd., St. Stephen.—These works were established as a dry mixing plant exclusively in 1911, with a capacity of 10,000 tons per annum. The fac-

* Abstracted from report: "Phosphate in Canada," Department of Mines, Ottawa.

tory is located on tide water, on the left bank of the St. Croix River, and the acid phosphate is brought up by schooner from Carteret, N.J., to the company's wharf. Considerable quantities of animal and fish tankage, as well as sardine waste from the Maine factories, are consumed. The company is affiliated with the International Agricultural Corporation.

Nova Scotia.

Colonial Fertilizer Co., Windsor.—The plant of this company has a capacity of 15,000 tons of mixed goods per annum. The works were originally started in 1889 by the Pidgeon Fertilizer Co., who conducted a ground bone business, this being later extended to complete fertilizer manufacture. The present company acquired the works in 1911, and have erected a large mill building, containing bin space for 10,000 tons. The raw materials—acid phosphate, bones, etc.— are procured chiefly from the United States, and a quantity of abattoir refuse from the province is also handled, there being three digesters to treat this class of goods. The plant is situated on tide water, about a half-hile from Windsor. The market for the company's goods is chiefly within the province, a certain quantity being consigned also the growers in New Brunswick and the Eastern Townships. The present company does business under various other names besides that of the Colonial Fertilizer Co., as, for example, the Pidgeon Fertilizer Co., New England Fertilizer Co., Essex Fertilizer Co., Lowell Fertilizer Co., and Parmenter and Polsey Fertilizer Co. All the foregoing, with the exception of the Pidgeon Fertilizer Co., are subsidiary concerns of the Consolidated Rendering Co., of Boston, who in turn, are affiliated with the Swift Packing Co.

Nova Scotia Fertilizer Co., Halifax.—This plant was established in 1878, and has a capacity of about 5,000 tons of mixed goods per annum. The plant handles most of the abattoir refuse, etc., from the Halifax district, as well as local fish offal. Whale bones are imported from Newfoundland, and acid phosphate from Baltimore. Ammonium sulphate is secured from Sydney, C.B. The works are located on tidewater at Fairview, Bedford Basin.

Ontario.

The Standard Fertilizer and Chemical Company, Smiths Falls.—This company was established in 1887, and has continued to manufacture small quantities of acid phosphate up to the present time. In addition to making acid phosphate, the company also prepares mixed fertilizers. Formerly, the sulphuric acid used was manufactured at the works, sulphur being obtained from Japan, and later from Sicily. In recent years, acid has been purchased.

A number of years ago, attempts were made to introduce ground, crude apatite as a fertilizer, but results did not prove satisfactory, the farmers who were persuaded to try the mineral on their land reporting that they could perceive no results at all from its use.

In addition to fertilizer acid phosphate, this firm has also engaged in the manufacture of acid phosphate for use as a substitute for cream of tartar in baking powder used in the preparation of self-raising flour. In making this substance, crude acid phosphate from the den is spread over large, shallow wooden trays lined with coarse sacking. Water is let into the trays, and the soluble acid phosphate is leached out and flows into lead lined trays beneath, whence it is led to a collecting vat. Here the liquid is evaporated and concentrated to a syrupy consistency, being afterwards mixed with a starch dryer. The residue remaining on the leaching trays, consisting principally of gypsum ("phosphate-gypsum" or "superphosphate-gypsum," as it is termed, according to whether it is completely freed from, or still contains a proportion of soluble acid phosphate), finds use as an absorbent purifier in lavatories, stables, etc.

The original plant was a small one, and a further reduction in size has been effected by the closing of the sulphuric acid portion of the works. Being situated on the Rideau lakes, and within easy reach of the Ontario apatite mines, the works were very favorably situated for obtaining supplies of apatite in former days.

Chemical Products of Canada, Ltd., Trenton.—This company has taken over the plant of the British Chemical Company, and proposes to undertake the manufacture of acid phosphate. The plant is equipped with acid chambers which are operating.

Gunn's, Ltd., Toronto.—This packing house has operated a dry mixing plant for a number of years, and recently installed an acidulating department. The capacity of the works is given as 10,000 tons of mixed goods per annum. Tennessee phosphate is used, and acid is procured from Hamilton. Packing house refuse, such as hair, horn, skin, etc., is also acidulated. Ammonium sulphate is procured from Montreal and Hamilton.

Ontario Fertilizers, Limited, Toronto.—Formed by the amalgamation, in 1912, of the fertilizer departments of the William Davies Company and the Harris Abattoir Company. The plant has a capacity of 10,000 tons of mixed goods per annum. Dry mixing solely is carried on.

Formerly, the principal market for this and other local fertilizer firms' goods, was the Niagara fruit district, but increasing quantities are now being taken by Ontario farmers for use on wheat and other lands.

William Stone Sons, Ingersoll.—A dry mixing plant, with a capacity of about 5,000 tons of complete goods per annum. Abattoir refuse is obtained from the Ingersoll Packing Company, tankage being prepared in a section of the plant devoted to rendering, etc.

W. A. Freeman Fertilizer Co., Hamilton.—This company is one of the oldest established in Western Ontario, having been in operation since 1886. Originally an aciduating plant, treating imported rock with acid procured from Tweed, Ont., the works since 1911 have imported prepared acid phosphate. The output is stated to be about 10,000 tons of mixed goods per annum.

A large part of the companys business is the obtaining of animal by-products from abattoir refuse, etc., and quantities of tallow, stearine, oils, and fats are produced, the tankage being utilized as a fertilizer ingredient.

Canadian Fertilizer Co., Chatham.—This concern which was established in 1914, and operates a dry mixing plant, has a reported capacity of 60 tons of mixed fertilizer per diem. In addition to the production of mixed goods, limestone, obtained from St. Mary's, is ground for agricultural purposes. Waste beet sugar liquor from the refineries at Chatham, Wallaceburg, and Kitchener, is also utilized. Acid phosphate is imported from Baltimore. This is the most westerly fertilizer works in Ontario.

Quebec.

The Capelton Chemical and Fertilizer Company, Masson. —Organized in 1902, this Company, for a number of

years, employed domestic apatite from the Lièvre River and Templeton phosphate districts, in the manufacture of acid phosphate. The works are located on the Lièvre river, at Masson, near Buckingham, Que., the power used being obtained from the falls alongside the plant.

In recent years, Florida pebble phosphate has almost entirely taken the place of domestic apatite. Prior to the war, the average cost of pebble was 13 cents per unit for 80 per cent. and over, laid down at the works.

In the manufacture of acid phosphate at this plant, the phosphate is first fed to a crusher, and is then elevated to an inclined, rotary dryer. The dried phosphate is elevated to a hopper, from which it falls to a No. 1 Sturtevant ring-roll mill, passing thence to an inclined 80-mesh shaking screen. The oversize is elevated back to the mill, and the fines pass to a hopper, from which they are bagged (200 lb. bags). Four bags (800 lbs.), of phosphate constitute a single charge for the mixer, and are agitated with about the same weight of sulphuric acid (50° Bé.). The mixer is of the shallow, rotary type with rotating stirrers. From the mixing pan the acid phosphate falls to a wooden den of 40 tons capacity; this quantity can be produced in about three hours. From the den the acid phosphate is shovelled to an elevator, and conveyed to a store bin of 120 tons capacity. From this bin it is elevated, as needed, to the mixing floor, where ammonia and potash salts, tankage, and filler are added, the whole being then passed through a Walker and Elliott disintegrator, in which it is thoroughly pulverized and mixed. The complete fertilizer is then elevated to the maturing bin, located outside the main building, where it is allowed to age for some months. For bagging, it is elevated back to the mixing floor and passed over a 15-mesh screen. The fines pass direct to bags, while the oversize is fed back to the disintegrator until of the desired fineness. The filler used is finely ground slag, the residue from the electric, phosphorus furnaces of the Electric Reduction Company, at Buckingham. This slag contains a small percentage of available phosphoric acid, and a large amount of lime.

Lesage Packing and Fertilizer Co., Montreal.—A dry mixing concern with a reported capacity of 2,000 tons of mixed goods per annum.

Tanquay and Co., Quebec.—A small dry mixing plant with a reported capacity of 5,000 tons per annum. Supplies mainly the district around Quebec.

As will have been noted, practically all of the fertilizer works in the country are located in the east, the largest concerns being in New Brunswick and Nova Scotia, where large quantities of fertilizer are used by potato and fruit growers; also in, or adjacent to, the agricultural region of southwestern Ontario. There is only one firm manufacturing fertilizer in the Prairie Provinces, and that in a very small way, namely, Swift and Co., at Edmonton, Alberta. The cost of transporting fertilizer ingredients for assembling in the west is practically prohibitive at the present time. The cost of acid phosphate laid down at Edmonton, for example, is more than double that of the material at eastern points.

The great bulk of the fertilizer turned out by Canadian firms consists of mixed goods prepared from imported raw materials. Only four of the concerns listed above are equipped with acidulating machinery for treating phosphate rock, and of these four, only two are in active operation at this date (March 1920).

Phosphorus Works.

The Electric Reduction Company, Limited.—This concern has been operating steadily since 1897, the works being located at the Upper Falls, Buckingham, Quebec. At various times such compounds as ferro-silicon, ferro-chromium and ferro-phosphorus have been produced in small quantities. Some years ago, two electric furnaces for smelting steel were installed, but were dismantled after a short run.

The quartz consumed in the manufacture of phosphorus is obtained locally, being derived from quartz veins and pegmatite dikes of the Archæan rocks to the north of Buckingham.

The price offered for domestic apatite, 75 per cent. standard, is about $11 per ton delivered. The supply, however, has been negligible during the past few years, and at the present time Florida pebble phosphate is used almost entirely.

The entire plant is run by power derived from the falls close by, the developed horsepower being 3,000.

About 90 per cent. of the phosphorus manufactured is exported, the remainder being consumed by domestic match factories. No details of production, manufacture, or of the processes employed are divulged.

Basic Slag Grinding Works.

There is one basic slag grinding plant in Canada, that of the Cross Fertilizer Co., located at Sydney, C.B.—a branch of Alexander Cross and Sons, of Glasgow. The works were completed, and operations commenced, in January, 1912, since when the plant has been running continuously. The capacity of the works is 40,000 tons per annum, and 40 hands are employed. The buildings are all substantial brick structures, the mill proper having three floors, and the storehouse for the bagged product being capable of taking practically capacity output. Box cars are run direct into this building, down the centre of which run the tracks, with a raised, concrete platform on either side.

Power for the grinding machinery is furnished by a 650 H.P. compound, tandem, direct drive engine.

The works are situated adjoining the Dominion Iron and Steel Company's plant, from which the slag is obtained. The slag is received at the works in 15-ton blocks, which are broken on the dump by a chain and ball "skull-cracker." The broken slag is then loaded on to tip cars, run to an elevator outside the mill building and hoisted to the feed hoppers on the third floor, from which it falls to the ball mills.

The type of ball mill used in the above described plant is an improved type of the Löhnert-Jenisch mill, specially constructed for basic slag work. In this machine, an axle is dispensed with, the drum being mounted at the feed end on rollers and at the opposite end on a trunnion. By this means, pieces of slag up to six inches in length can be fed to the mill, and the risk of axle breakage, due to an over-charging of the drum, is eliminated. The machine is fitted with coarse screens only, mounted on wrought iron frames.

The Löhnert axleless ball mill is made in four sizes, the diameter of the drum ranging from 7¼ to 8½ feet. The number of revolutions per minute is 24, and the H.P. required is from 30 to 60, according to the size. The capacity is from 26 to 52 tons per hour.

The tube mill used in conjunction with the above ball mill has also been designed expressly for grinding basic

slag. The drum of this mill consists of a welded tube, which is supported on rollers and runs on heavy rings. The slag grit is fed in at the hopper end, is completely pulverized by steel balls while passing through the drum, and discharges through a sieve-drum at the farther end. This sieve automatically separates any steel fragments still remaining in the meal. The mill is made in three sizes, all of similar diameter, but ranging in length from 23 to 26 feet. The drum makes 28 revolutions per minute, and requires from 110 to 160 H.P. to drive it. In place of silex lining plates, chilled steel plates can be substituted.

The ground slag is weighed in a 3-hopper, automatic "Libra" bagging scale, manufactured by the Automatic Scale Co., of Gliesmarode-Brunswick, and is put up in bags of 200 pounds. The slag is ground to 100-mesh.

The whole of the grinding installation was designed and erected by the Hermann Löhnert Company, of Bromberg, Germany, specialists in slag grinding machinery.

The market for the ground slag was originally chiefly within the Province of Nova Scotia, but an increasing amount is now being shipped to inland points.

Basic slag is a by-product obtained in the dephosphorizing of steel. The process by which it is formed was first applied in 1879, by Gilchrist and Thomas, of Battersea, England. At first regarded as of no value, basic slag has come to be used in ever increasing quantities as a fertilizer. The total amount consumed in 1912 reached the large total of four million metric tons.

Although experiments between 1880 and 1890 conclusively demonstrated the value of finely ground basic slag as a fertilizer, it was not until the citric acid solubility test for the phosphoric acid contained in it was introduced as a standard that fertilizer manufacturers were induced to favor its use. It was mainly as a result of the endeavors of German chemists and manufacturers, notably of G. Hovermann, of Hanover, that basic slag came to be recognized as a valuable fertilizer, and Germany in 1912 headed the world's production with nearly 2,500,000 metric tons annually.

Formerly, iron ore containing over 0.025 per cent. of phosphorus was considered useless for the production of good steel, owing to the brittle qualities imparted to it by the phosphorus. The Thomas process, whereby ores rich in phosphorus are rendered utilizable, has since become the basis of manufacture of the major portion of the world's production of steel.

Briefly stated, the dephosphorizing of phosphoric pig iron is effected in what is known as a basic Bessemer converter. In the ordinary Bessemer process, the converter is lined with a siliceous material. In the basic converter, the siliceous is replaced by shrunk dolomite, known as "basic" material, rammed with anhydrous tar. This lining, together with lime additions made during the blow, allows of the formation of a phosphate of lime (tetracalcic phosphate) which is not decomposed by metallic iron at the high temperature of the converter, and thus practically the whole of the phosphorus present in the iron is removed in combination with the lime in the slag.

A basic Bessemer plant does not differ radically from an acid plant, the only additional requirements being facilities for conveying large quantities of lime to the converter and for removing the large amount of slag produced. The latter operation is effected by pouring the slag either onto the pit floor, where it is watered, broken up with bars and wheeled away red-hot ("poured slag"), or direct into iron dump cars ("block slag"), which transport it to the slag dump. "Poured slag" is harder and more homogeneous than "block slag."

Pig-iron containing as high as 3.5 per cent. phosphorus may be used in the manufacture of steel by the basic Bessemer process.

The basic Siemens or open-hearth process for the removal of phosphorus depends, in the same manner as the foregoing, on the formation of stable phosphates, and the dephosphorization is effected in the same way by means of a basic or neutral furnace lining, and by lime additions during the working of the charge. Pig iron with 2-3 per cent. of phosphorus may be employed with the basic Siemens process.

The following represents the average composition of a basic slag produced by the open-hearth process:—

	Minimum.	Maximum.	Average.
SiO_2	2.70	12.00	7.96
FeO, Fe_2O_3	7.77	25.00	13.19
MnO	0.55	5.62	3.91
CaO	28.00	58.91	48.29
MgO	1.14	8.10	4.89
P_2O_5	11.39	22.97	17.25

The P_2O_5 content, thus, ranges from 11 to 23 per cent. Basic slag slakes in the air, the caustic lime absorbing moisture and carbonic acid, and the ferrous iron oxidizes. Porous portions of a slag mass exhibit tables, needles, and prisms of tetracalcic phosphate ($4CaO. P_2O_5$).

In the early days, it was considered that basic slag needed to be treated with acid in order to render its phosphoric acid available for plant food. Scheibler prepared precipitated phosphate ("Thomas precipitate") by treating 100 parts of powdered basic slag with 120-150 parts of hydrochloric acid, and precipitated the phosphoric acid with milk of lime (German Patents No. 24,130 and No. 25,020). Franke proposed to decompose the slag with magnesium chloride (German Patent No. 27,106) and to convert the phosphoric acid into phosphate of magnesia. Meyer's process (German Patent No. 47,984) consisted in treating the still fluid basic slag with its own weight of acid sulphate of potash.

It was established by Reis and Arens, however, that the P_2O_5 in basic slag is soluble in water containing carbonic acid, and that, for this reason, there is no necessity to resort to methods of treatment in order to render the P_2O_5 available. It is from the date of the researches by the above chemists that the use of basic slag in agriculture dates.

It has been shown, however, that slags from different smelters exhibit by no means constant, active fertilizing properties, even when possessing equal contents of phosphoric acid and when ground to a similar degree of fineness. Assuming 100 as the efficiency of a good slag, some goods have been found to possess only 60, 50, and as low as 40 per cent. This fact has led to the adoption of the citric acid solubility test as a basis of valuation, in place of the earlier guarantee of fineness. Higher efficiency in a slag corresponds, almost invariably, to a higher silica content, and it is thus possible by the addition of sand to the fluid slag to increase its value as a fertilizer, at little or no extra cost.

The formation of tetracalcic phosphate in the furnace is represented by the following equations:—

$$Ca_3\ (PO_4)_2 + Ca_2SiO_4 = Ca_4P_2O_9 + CaSiO_3$$
$$Fe_3\ (PO_4)_2 + 2Ca_2SiO_4 = Ca_4P_2O_9 + Fe_3Si_2O_7$$

Silica, therefore, plays a very important part in basic slag.

The decomposition of tetracalcic phosphate by water containing carbonic acid proceeds according to the equations:—

$$(1)\ Ca_4P_2O_9 + CO_2 + 4H_2O = CaH_4\ (PO_4)_2 + 2Ca\ (OH)_2 + CaCO_3$$

or

$$(2)\ Ca_4P_2O_9 + 2CO_2 + H_2O = 2CaHPO_4 + 2CaCO_3.$$

There is thus formed either (1) the monocalcic phosphate found in acid phosphate, or (2) "precipitate."

At Hoerde, in Westphalia, so-called "patent phosphate meal" was formerly manufactured by the Scheibler process (German Patent No. 34,416 and No. 41,303). This method consisted in adding slightly less lime to the iron in the converter than is required for complete dephosphorizing. This slag, rich in P_2O_5, is then run off, lime is added to the steel in the converter, and the low percentage slag which results is employed as reducing material for a new charge.

If phosphatic chalk be substituted for lime in the converter, with or without the addition of sand, a slag richer in phosphoric acid is obtained.

FLAT SOURS*

By Milo R. Daughters†

A FLAT sour is that form of spoilage caused by micro-organisms which take possession of a wholesome can of food after it is processed (cooked). This condition is not recognized until after the can is opened, since no gas is produced to change the external appearance.

Underprocessing.

Owing to the different rates of heat transfer in different kinds of canned foods, underprocessing may be the cause of flat sours, although most of the spoilage from this source shows up as swells. In starchy foods like corn it requires from ten to twelve times as long for the heat to penetrate to the centre of a No. 2 can (about 560 grams of water in capacity) as it does in the same sized can of peas. This means that corn must be subjected to a much longer period of heating, or process, as canners call it, and a higher temperature, if the centre of the can is to receive sufficient heat for sterilization. The reason for this difference in the rate of heat penetration of corn and peas is due to the manner by which heat is transferred. In corn, heat travels by conduction to the centre of the can, whereas in peas, heat is transmitted by convectional circulation of water in the interstices of the peas. Water is a very poor conductor of heat unless it is free to circulate. While food contains from 75% to 95% water, it is held in small microscopic compartments and so is not allowed to carry heat from one part of the can to another, except in such products as peas, asparagus, fruits, (in halves or quarters), etc., between the spaces of which the water is free to move.

The time required to reach the sterilizing temperature in the centre of the can depends to some extent upon the initial temperature of the food material when it is placed in the cans. If heat must travel by convection then it is essential that the food should be placed in the container at a high temperature before it is sealed.

Materials differ widely in their power to conduct heat. Under the same conditions iron conducts about one hundred times as much heat as water. At the freezing point water molecules have an average speed of about 2,360 feet per second or about 29 miles per minute. Each moves in a space just slightly larger than its diameter, which is about 0,000000015 inch. As a result of their proximity they collide many times and the higher the temperature the more rapidly they collide and the harder they strike against each other. In this way the heat passes through corn. The larger the container the longer it takes for the flow of heat to reach the centre.

Understerilization may result from insufficient steam circulation. If the steam vents in the retort are not kept open during the process, the heat from the retort will not be evenly distributed owing to the formation of air pockets, etc., notwithstanding the fact that the attached thermometer and steam gauge may show the desired degree, and pounds of pressure respectively. A good circulation of steam is essential for proper processing and is accomplished by proper venting of the retort.

Cooling.

Thermophyllic (heat-loving) bacteria sometimes withstand the processing temperatures applied to foods like corn (sometimes cooked less than 250 F. for 70 minutes) and remain in the can to develop only when the conditions are favorable. If, however, the temperature is reduced to 100 F., these organisms can not grow effectively and so do not give trouble. It is necessary, therefore, to cool processed foods thoroughly before storage. Starchy foods, like corn, require longer cooling than peas or asparagus through which the liquor or brine may move more or less freely. No 2 tins of corn will require approximately 15 min. for cooling when moved through a cooling tank of water having a temperature of 15 degrees C. No. 10 or gallon tins of corn will require a much longer time.

Leaks in the Containers.

The most annoying cause of flat sours is due to leaks, which occur in the containers. Many of our cans are sealed with ends which contain a paper gasket. When the food strikes the gasket, the paper swells and in many cases stops the leak. Owing to a partial vacuum in the can, bacterial bearing water may be drawn through the gasket which serves as a filter. Generally speaking the roll is made too tight to allow of this except in an occasional can, which is defective. In starchy foods the starch often plugs up a minute leak and the cooking renders the food sterile. These minute openings may be impregnable to most micro-organisms of the larger varieties, but occasionally one or more of the non-gas producing forms gain entrance, the food spoils, and later a flat sour is discovered. More trouble seems to occur in starchy foods than in those with a clear liquor or brine. This appears to be due to the fact that starch assists in completely barricading leaks, especially to the gas-producing types. In food with a clear liquor the spoilage is indicated by the bulging of the container and the packer does not ship it out.

*An address delivered at National Canners' Convention, Atlantic City, January 20th, 1921.
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The Chemical Engineer and the Groundwood Division of the News-Print Industry

Difficulties Met With and Overcome by Technical Control*

By R. W. McKENZIE.

THE paper machine operators were having trouble in getting the sheet to mat properly on the wire and the superintendent went to the grinder room and informed the foreman that his stock was "free." The foreman got his blue glass and placed some of the stock on it and studied it for some time and then stated that it was the same kind of stock that he had been making right along. He did not have a sample of the previous day's stock, but he was quite confident that it was the same. The paper mill man was just as sure that it was different because it wouldn't make paper. The wood is held against the stone by a hydraulic ram and the pressure of this ram varied. The stones are sharpened with burrs and the degree of sharpening helps to govern the kind of stock. The "free" stock means a fairly coarse fibre that allows the water to drain away from it rapidly, so that on the machine wire the water has passed through before the vibration has properly matted the fibres. The "slow" stock is the opposite of the "free" and while there are many degrees of freeness and also of slowness, with the operator it was either "slow" or "free." Taking into consideration the fact that the water drained quicker from some groundwood than from others, a sedimentation machine was constructed in the laboratory and the machine was standardized so that stock of the same degree of freeness would allow the same amount of water to drain from it in the same period of time. From many tests graphs were made and sedimentation samples were taken throughout the day and the operators in the grinder room were shown how their stock was running. These sedimentation tests practically eliminated the troubles due to "free" and "slow" stock. The pressure gauges on the grinders were tested periodically and kept accurate. The microscope was also used and slides were made of the stock and compared daily with standards. Graphs were made for the help of the operators and in this department it was found that when they understood the charts, the men preferred them to figures.

Consistencies.

The groundwood on leaving the grinders passes into sliver screens where the large slivers are taken out and the stock then goes to the rotary screens, the good stock from here goes to the thickeners and then to the mixing room. The rejects or tailings from the rotary screens go to refiners and after being refined go back into the system. The consistency leaving the grinders is about 30%, leaving the sliver screens it is about 1.00%, leaving the rotary screens it is about 0.5% and after the thickeners it is about 3.0%. Tests of these consistencies showed that the foremen in the screen room were holding the percentages fairly constant per shift, but each one was different. One foreman who ran his stock the thinnest, i.e., had the lowest consistencies, had the most waste down the mill sewer. He was using so much water in the system that he had a good many overflows. Studies of the methods of the foremen were made and they were tied down to set consistencies. By making, the taking consistencies and the observations of overflows, routine in the laboratory, the waste was reduced as much as 8 tons per shift. This stock saved was at the least two-thirds No. 1 groundwood and taking this at $25 per ton, which is a low price now, would mean $375 per day in the groundwood department that would be credited to the technical department. It was not sufficient that these wastes be pointed out to the men and let go at that, for they would soon forget about it or doubt the figures of the technical department. Observations of overflows were charted and placed before the operators as soon as taken. The consistencies came out slower but anything unusual was quickly noticed before the samples were put in the oven and this condition was immediately brought to the attention of the operator. It was found that where it was not convenient to put recorders on operations, the great amount of work on the problem was not finding that there was a leak, but in putting the proposition before the operators so that they would always be on their toes. This was accomplished by creating a spirit of rivalry amongst the weak brethren. One at least of the operators comes close to the standard usually and by charting comparatively the work of the different foremen, the men begin to take a deeper interest. If they can not right conditions themselves, they will appeal to the technical department if the right impression has been made by the engineers. The sulphite stock was partially handled by the groundwood screen room and the same methods were adopted, so that the operation of the sulphite screening system would be more uniform.

Air-Dry Stock.

The paper-mill was not using all the screened stock and the excess was run over wet machines, where it was lapped and then put in hydraulic presses where the water content was supposed to be brought down to 45%, making about 60% air-dry stock as the buyer paid for 10% water. Instead of averaging 60%, this department was turning out stock that was running 51% with a minimum of 47% and a maximum of 55%. By charting the results of the different foremen it was found that each foreman was getting about the same average each day, but they all had, apparently, operating methods that were different as no two averages were the same. Two foremen were complaining that they did not have sufficient men to handle their laps from the presses to the cars, while the third foreman was able to handle his own production and what the others were leaving on the floor with an equal force of men. The third foreman was getting the highest percentage of stock in his lap, therefore his men were not forced to carry so much weight per shift. The other foremen had their workmen carrying water that should have been taken out in pressing. The buyers also objected to paying freight on so much water and the manu-

*Third of a series of four articles dealing with the pulp and paper industry, and published in our March, April, May and June, 1921, issues.

facturer had to assume a portion of the freight on account of the excess water. Charts of the different foremen's percentages were made up and shown to them. At first they were antagonistic and laid the blame on everything but their own shoulders. Nevertheless the average was increased from 51% to 55% in a week without any outside help, but this seemed as far as they could go and the standard had been set at 60%. The technical department took a hand and first the percentage of moisture taken out by the wet machines was standardized. Then the folding of the laps was improved so that the press could work evenly. The piling of the laps on the trucks before putting into the presses was gone into thoroughly and finally the time in the press was controlled. As a result of this investigation, the percentage of lapped stock was brought up to 60%. The saving made here was the eliminating of freight charges of about 10% on each car of stock shipped and also the reducing of the waste in this department which waste was caused by uneven operation. Another saving was made by putting the testing and sampling under men trained by the technical department and having the supervision of this work in the hands of the engineers. This latter easily meant a gain of 1% on the percentage of air-dry stock as the previous methods were not accurate.

Whitewater.

In the process of screening the consistency of the stock is very low and then the thickeners or deckers take out a good portion of this water. But some of the fine stock gets through the wires of the thickeners and instead of the water coming away clear it is cloudy and is called whitewater. The stock in the whitewater is very necessary in making a uniform sheet of paper. Some of this whitewater was being used over again to wash and screen the stock but it was not all being used, therefore good stock was getting away into the sewers. Sets of consistencies of whitewater showed that a good percentage of the mill waste was attributable to the whitewater that was not being used over again. Saveralls were installed with finer wires than on the thickeners and in this way many tons of this fine fibre were saved. But the capacity of the savealls, although rated to take care of this excess whitewater, was not sufficient and the waste was as bad as ever. The technical department found that as soon as the operators learned that savealls were put in, they started using more fresh water and this increased in proportion the amount of whitewater. It necessitated putting flow meters on the fresh water lines going to each department and they were only allowed so much water per ton of product. When this was done the saving, that should have made itself evident when the savealls were first put in operation, soon became apparent and the general mill waste was reduced by 12 tons per day.

Mill Waste.

As an example of what our mills have put into the sewers in the way of good stock both groundwood and sulphite it is only necessary to go to the sewerage outlet and see the accumulation of stock that has not been carried away by the stream into which the sewer empties. Most of the stock wasted in this way has been carried away by the river but there is usually sufficient left to give an idea that pulp was plentiful. The technical men have proved a large factor in cutting down this sewer waste. Weirs have been put on the different sewers, level recording gauges and automatic samplers installed so that the real tonnage is known and then the technical men have tied down irregularities within the mill so that large wastes cannot happen without having a record and then the cause is immediately found and the trouble remedied. The blow-pits have a draining bottom several feet above floor of the pit so that the liquors may drain away. These liquors have a sewer line of their own and it was found that something would happen to the perforated bottom of the pit and that good stock would get away with the liquors, so the weir and sampler were put on this sewer and many a ton of sulphite pulp was saved.

Present and Future Problems.

The average yield from a cord of prepared wood, which weighs 4,500 lbs., is 2,000 lbs. of groundwood. The groundwood contains quite an appreciable amount of the pitches and resins of the wood. Allowing 40% for the average moisture content of the wood, it leaves about 2,700 lbs. from which the 2,000 lbs. of groundwood is obtained. There is a very small percentage of the pitches and resins of the wood that are soluble in water. The main loss here is in the grinding. Under the present system of grinding many slivers are made. In the near future if the problem is tackled in earnest, much of this waste will be reduced, better grinding methods will be instituted and the yield per cord will be higher. It is also possible that even during the grinding or later when the stock is ready for screening that the groundwood will be treated so that the majority of the pitch and resin content will be taken out and be a valuable by-product. The stock on leaving the grinders is thinned with water so that the sliver screens work to the highest efficiency, i.e., take out the large slivers and not carry away good stock. The stock is again thinned before it enters the rotary screens as there is a certain consistency at which these screens work best. At the present time there is no consistency recorder that will advise the operator at all times what the consistencies are throughout the process. It is badly needed and there is no doubt but that an automatic consistency recorder and regulator can be designed that will work on the thin consistencies and be attached to the whitewater valves so as to elminate so many of the variables. The whitewater in the sulphite and groundwood mills will be put into savealls that will probably function similarly to the centrifuge and all the stock will be taken out and fresh water will be used to wash the stock as it will produce a cleaner pulp, especially in the sulphite department. In the working out of these problems it is probable that many changes will be made in the processes and there is surely quite a very extensive field for the chemical engineer in the pulp and paper industry.

DOMINION FOUNDRIES COMPLETE PLANT.

Dominion Foundries and Steel, Limited, Hamilton, Ont., have just completed their $1,500,000 plant to produce billets and blooms from 3"x3" to 8"x8" thick, and from 6" to 10" wide. These are now available, while skelp of all sizes and weights from 8" upwards can be made. Universal plate 7" to 41" of any thickness and length, sheared plate up to 66" in width. The mill has a capacity of 150,000 tons per year and is the last word in modern construction.

CENTRIFUGAL EXTRACTORS AND SEPARATORS APPLIED TO THE CHEMICAL INDUSTRY

Points the Chemist Should Know Concerning Operation of Hydro-Extractors*

By J. F. BROADBENT

IF water be placed in an open can and the can be swung in a vertical plane in such a way that the can is upside down in the top position, it is found that at moderate speed the water remains in the can and does not fall out. This is not because the time is too short to allow of such a fall, for if a tap be opened at the bottom of the can water issues upwards from this when the can is in its highest position. This is a simple example of centrifugal force. It will be readily understood that the quicker the speed of rotation the more quickly does water come through the tap. All hydro-extractors which expel liquids through openings in a rotating cage or drum apply this simple principle. There are far more large hydro-extractors built and used of this form than of all other forms put together.

Chemist's and Engineer's Point of View.

The chemist and the engineer approach the problem of the hydro-extractor from different points of view. A failure to recognize them may result in a chemist asking for a hydro-extractor to perform quite impossible tasks, and on the other hand in an engineer supplying a hydro-extractor which is afterwards found to be unsuitable. This is particularly likely to occur where a chemist is developing a new and secret process. In his anxiety to prevent information leaking out he gives the engineer the scantiest of information and is then liable to be disappointed at the result. In such cases there is a very simple remedy. The chemist should choose a firm of hydro-extractor makers of repute and give the fullest information.

In dealing with any problem of hydro-extracting the chemist will, amongst other matters, be concerned with:—

(a) The quantity of material to be dealt with per hour.

(b) The labor required to deal with this quantity.

(c) The initial outlay on the plant.

(d) The running costs.

(e) The power required to drive the machine.

(f) The quality of the resultant products.

(g) The resistance of the various parts of the hydro-extractor to any chemical action.

(h) Freedom from breakdowns and reliability of running.

(i) Simple and clean system of lubrication.

(j) Absence of complication of handles, etc., for running the machine.

The chemist will always have the above in mind and in addition may have special problems to be solved.

The engineer in the design must endeavor to satisfy the whole of the above points and will have to consider:—

(a) The strength and accessibility of the various parts of the machines.

(b) Balancing of rotating parts.

(c) Protection of all wearing parts.

(d) Efficiency of drive. .

(e) Safety devices and brakes.

(f) Provision for dealing with loading, discharge and effluents.

(g) Methods of taking up the inevitable vibrations.

(h) Drainage and foundations.

Hydro-Extractors for Sulphate of Ammonia.

It is the chemist's points we are now considering. Let us examine this in connection with hydro-extractors for dealing with sulphate of ammonia.

The last stage in the manufacture of sulphate of ammonia is drying off by means of a hydro-extractor. The liquid in the salt may be slightly acid before reaching the extractor, or it may have been neutralized before reaching it. It is essential for the engineer to know which process is to be used because it will affect his design. If the liquid is slightly acid it will rapidly corrode iron and steel. Hence for this case the cage—as the rotating part is called—must be made of acid-resisting material and the best for the purpose is probably copper. Moreover, since the dried sulphate is a powder something like salt, the perforations in the cage must either be very small or an inner lining of copper gauze must be used. The former is less troublesome, but may have the defect of retarding the drying process. Each has its advocates.

Again, the outer casing, or "pan" as it is called, in which the cage rotates and where the extracted liquid is collected and discharged must fulfil two important conditions. First, it must be acid proof, and for this purpose it is usually lined with lead. Second, it must be strong because copper, of which the cage is made, is not very strong metal, and moreover is slowly corroded by the acid, so that after some years of working, and if neglected, there is a possibility of the cage bursting. The outer casing should, therefore, be of steel and not of cast iron.

Then we have to consider how to load and to discharge the cage. The former may be done by shoots or tilting buckets running on an overhead runway and tilted over the hydro. This is hardly within the scope of our subject, but for unloading, the design of the hydro is important. It is clear that if the sulphate has to be lifted out over the lip of the cage, the cost and difficulty of labor will be very great, and that the only economical plan is to discharge it through openings in the bottom of the cage and the pan. Hence we have a "bottom discharge" hydro-extractor, but this involves a further point. The hydro must be raised up some height above the floor, so that the discharge may be made into some barrows or something similar or on to the floor below through a shoot.

If the machine is on a raised platform this may be done, though because of vibrations set up by the rotating loaded cage and the necessity of not transmitting these to the building, the hydro should be either of the "suspended" or "Weston" type. The former applies to "under-driven" machines where the driving power is applied underneath the cage and the bearings are rigidly fixed in the pan. Thus, though the cage can rotate in the pan, it cannot in any other way alter its position with respect to it. Hence, if the cage oscillates due to an uneven load the pan must oscillate with it, and for this reason the pan is suspended on three swinging rods which allow it to swing and so prevent great forces being transmitted to the foundation which otherwise would need to be very massive.

*From a lecture delivered by Mr. J. F. Broadbent, of Thomas Broadbent & Sons, Huddersfield, England, to the Manchester Municipal School of Technology, December 2, 1921.

In this type of hydro-extractor a considerable space near the centre of the cage and pan is taken up by the machine itself, because for constructional reasons provision has to be made for a central bearing near the level of the top of the cage. It follows therefore that the bottom discharge must be made in the cage at some little distance from the centre, and for this purpose two or four openings, with doors, are made in the bottom of the cage. These are brought in turn opposite the opening in the bottom of the pan and the dried salt is then shovelled through.

The "Weston" Type of Machine.

In the "Weston" type of machine the drive is transmitted from above, through a vertical shaft hanging downwards. The bearing of this shaft is above the machine, and is "housed" in such a way that it allows the whole cage to swing with the driving shaft just like a pendulum. This allows the cage to take up the necessary position for an uneven load, and if the housing buffer is properly designed the swings of the cage, which exist at low speeds, die out before they become too violent. It sometimes happens with some forms of elastic support for the housings that after being in use for some considerable time, say one or two years, the swinging is not properly damped, and the oscillations become serious. In all such cases the buffer should be renewed without delay. It is because of this that special attention has been given by engineers to this upper housing, and in one form the support is on a spherical metal seat with a rubber buffer for damping oscillation only, and not for taking the heavy weight of the rotating loaded cage. This is instead of the conoidal rubber buffer which serves the double purpose of damping oscillations and supporting the cage in the simplest possible way. In this type of hydro the discharge is from openings very near the centre of the cage, and at the centre of the pan, since the rotation is transmitted to the cage through arms much like the spokes of a wheel, and the discharge can be made through the openings between these arms. Hence this type of machine is sometimes called "central bottom discharge.'

The braking arrangements need not detain us. It is perhaps worth noting that with the under-driven type of machine it is usual to put the brake on the cage, thus causing no stress in the driving spindle, but that this is impossible in the Weston type owing to the swinging cage and the brake must in this case be applied near the top housing. As braking causes a much more severe twisting effort than driving, the driving shaft for this case has to be considerably stronger than necessary for the drive only.

Figures of Performance.

Now if the sulphate is neutralized before passing into the hydro, a black steel cage may be used. This is cheaper and stronger than copper, but even with neutralized sulphate slow corrosion appears to take place, and it is advisable to use a lead-lined pan. The following figures of performance are taken from actual practice. They refer to a 48-in. diameter cage. Each charge weighed about 3 cwt. About seven charges were made in two hours. The extracting was carried out by rotating at full speed for two minutes. Life of gauze six months, and of cage five years. The moisture in the finished product amounted to just over 2 per cent., and the ammonia to 25 per cent. The speed of rotation would be about 900 per minute.

The labor required to work the above hydro would be two men, one occupied at the filling, and the other at the discharging end of the hydro. They would also be responsible for cleaning out the machine which should be carried out very frequently. About 4 h.p. is ample for driving such a hydro. The problem of hydro-extracting sulphate of ammonia has been dealt with at some length, because it is absolutely typical of a great number of chemical problems which the hydro-extractor can deal.

Let us next consider a similar problem, but involving certain further difficulties. This relates to drying a material having a specified gravity of 1.15, and which is much finer when dried than sulphate of ammonia. Gauze, therefore, is not sufficiently fine to prevent this material from passing through, so that a gauze is placed immediately against the side of the cage to support a filter cloth, and this in turn is protected by another gauze in front of it three thicknesses in all. The machine in which the substance is treated has a cage 72 in. diameter, and like the sulphate of ammonia machine is provided with a bottom discharge arrangement. The material before treatment is in the form of a slurry, and is fed when rotation is at full speed. The process is a long one, and only six charges of 700 lbs. each can be made in a day of 20 hours. The surface moisture is reduced to 2 per cent. Such a machine is used for six days per week, and as the product is valuable you will readily realize the importance of the engineer providing a sound, simple, reliable article.

A very interesting feature about this machine is the slow-speed rotation gear and scraper. We are not considering drives, as that is reserved for another lecture, but it may be mentioned that this machine is electrically driven and that the slow speed (40 per minute) is obtained by an auxiliary motor driving on a toothed rack under the cage and so arranged as to come out of gear automatically if the main drive is started up. The scraping gear is hand-operated, can be moved radially or vertically and is very satisfactory for this powdery material, removing it from the sides at the slow speed and so easing the labor of discharge, but such a scraping gear might easily prove valueless if the character of the material is altered slightly, as, for example, if it becomes of a pulpy nature.

A further point is worth noting before leaving this machine, and that is that for such a size as this no maker would venture to make the Weston type of hydro-extractor. The risk of dangerous swinging would be too serious. We may take it as a general rate that above 48 in. diameter of cage two fixed bearings are necessary.

That brings us to consider another matter. What is the drying effect of a large machine as compared with a small one? Instead of answering this question directly let us see what outward pull is given by a pound weight rotating at different speeds and different radii. This will give us a means of making comparison because it is this kind of force which causes moisture to leave the material to be dried.

If N=revolutions per minute.

D=diameter of path in inches

The force becomes $\frac{1.42}{100,000} N^2 D$

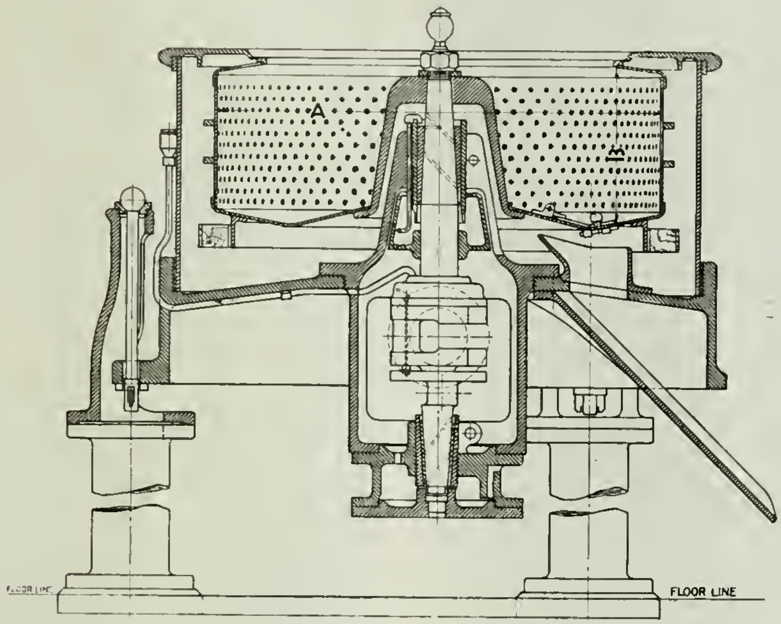
Thus, for a 42 in. machine rotating at 1,000 revs. per min., this becomes

$$\text{Centrifugal force in lbs. for 1 lb.} = \frac{1.42 \times 1,000^2}{100,000} \times 42$$

$$= 596 \text{ lb.}$$

or, put in another way, the force exerted is 596 times the weight, that is, the gravitational force. Hence the term that the action of a centrifugal machine causes a force equal to so many gravities. The values have been tabulated and may be found in the Mechanical World Pocket Book. We will just glance at one or two of the figures for actual machines of the kind we are considering.

Diameter of Hydro Cage.	Revolutions per min.	Gravities.
9 in.	2,200	618
18 in.	1,500	575
26 in.	1,200	532
30 in.	1,150	561
36 in.	1,100	618
42 in.	1,000	596
48 in.	950	614
54 in.	850	552
60 in.	750	478
72 in.	650	431



Section of Type 3 Steam-Driven Bottom Discharge Centrifuge.

From the above it will be seen that the drying effort is less with large-sized machines for practicable speeds, but this is not necessarily a defect because the drying may still be quite sufficient. In some cases—for example, low-grade sugars—the centrifugal action would need to be kept lower than the least of the values given in the table.

Modifications.

It will be appreciated that the kind of extractor with which we have been dealing is capable of many modifications. If it is required to deal with fabrics, for instance, a bottom discharge is unnecessary; for some substances the process must be carried out at a high temperature so that steam coils or a steam-jacketed pan must be used. The slide shows a modification in which dangerous or explosive gases are given off. There is a gas-tight lid and a special water seal which allows the hydro-extractor to oscillate freely, but nevertheless, prevents any leakage of gas.

Acid-Resisting Material for Cages.

Attention has been drawn already to the necessity of using some acid-resisting material in certain circumstances for the construction of cages. There are two possible plans. One is to choose a metal such as copper or monel metal which has high acid-resisting properties and the other is to coat a steel cage with acid-resisting material. Unless temperatures are high, say, over 90°C., and unless the cage is subjected to severe handling, the best method of coating is with vulcanite. There is one possibility of defect with a vulcanite cage. Even a fine perforation through the vulcanite to the metal will admit acid which will cause corrosion of the metal behind the vulcanite without any external indication of this. There is, however, an electrical test which amounts to an insulation test and is carried out at 2,000 volts. By a special apparatus this test is easily applied to every portion of the cage and should be insisted upon by every buyer of a vulcanite cage to be used with weak acids. If, however, the cage is to be used merely for cleanliness—a very important use—and no acid is present, the test may be dispensed with. It is also worth having a vulcanite cage tested electrically annually to detect any flaw which may have arisen during use.

Separating Liquid and Solid.

In dealing with some chemical substances in which separation between a liquid and solid is required, the method described for sulphate of ammonia is not applicable, because the solid portion is of such a nature that it rapidly forms an impervious layer through which the liquid is unable to pass. This necessitates a solid or imperforate rotating cage, i.e., one without perforations on which solids are deposited and some means of discharging the liquid which collects on the inner surface of the solids. Considerable attention has been paid to this problem in recent years. The first feature we notice is that there must be a number of radial baffle plates. These serve the purpose of causing the liquid to rotate at the same angular speed as the cage, and also to prevent the development of bad vibrations, which are familiar to everyone who has experimented with imperforate cages with liquids. The feed is through a funnel and pipe leading to the bottom of the cage underneath a horizontal plate rotating with the cage and having a space at the back near the cage periphery, through which the feed must pass. Thus all the material fed into the cage is forced to pass near the cage shell and any heavy solids are deposited against this shell and do not return. A similar horizontal plate to the lower one is secured near the top of

the cage and its lip extends rather nearer to the centre than the actual top lip of the cage. An adjustable skimmer pipe is attached to the pan top and so arranged that its cage faces the direction of motion of the rotating liquid. As this pipe is slowly introduced into the liquid the latter is discharged through it. In this machine, part of the liquid from which the solids have been extracted is discharged over the upper lip, but there is a lighter liquid which builds up on the lower side of the top plate and is finally skimmed off. It is used for recovering part of the grease from the liquid, which contains a small amount of solid matter. When the solid matter has built up a sufficiently thick layer the machine is stopped, the solid is removed and the machine is cleaned for a fresh start.

The Gee Machine.

The modifications of this machine are worth further consideration. The first is the "Gee" machine. This machine is used for extracting and grading fine solids from a liquid and for filtration of the liquid. The imperforate rotating cage carries six removable internal plates, on which the solids are deposited. The filtration is performed by an inward flow of the liquid, so that choking of the filtering medium does not take place, owing to the centrifugal action forcing the solids in an outward direction. Moreover, fine filtering mediums can be used, since they are held in position by centrifugal force.

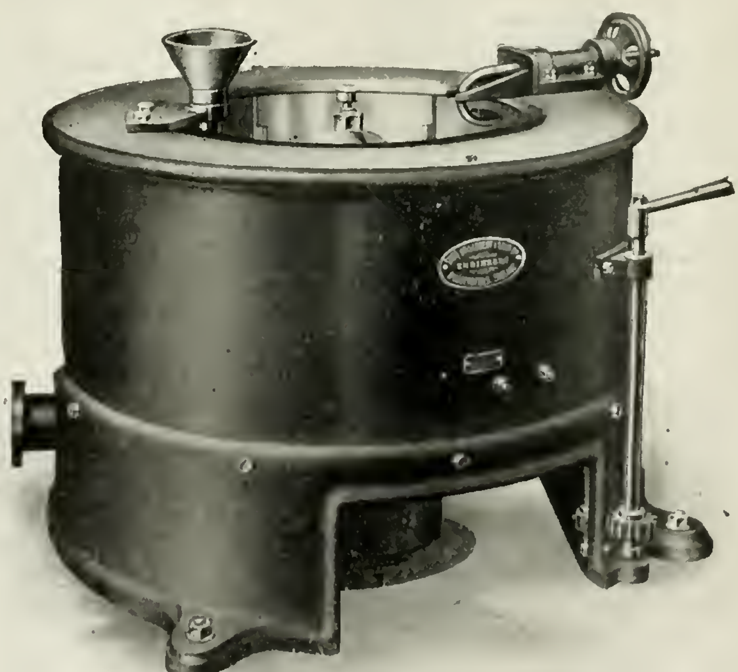
The feed is supplied by a pipe near the driving shaft and passes over a distributor plate. This operation is carried out whilst the machine is working. The centrifuging takes place in a pit and, when complete, the machine is stopped, the plates with the deposited solid are hoisted up and lifted away by men. This machine also grades the solids by the rate of flow, and the finest solids are near the bottom of the plates, the heavier being above, so that they can be readily separated by horizontal cuts. Like all the machines hitherto considered, this is still an intermittent action machine.

In the Sturgeon type of machine we have a machine designed to carry out the same purpose as the Gee, with the exception of filtration, but with the additional point of being continuous in action. In order to secure this, the great pressures generated by water in rotation, as in a centrifugal pump, are used to discharge the treated contents of the cage.

Application of the Continuous Principle.

In separating liquids of different specific gravities, the continuous principle becomes readily applicable, but the application is different from that of the machines already considered. Without entering into the theory, it may be stated that if a mixture of two liquids of different specific gravities be applied near the centre of the rotating imperforate drum and a horizontal dividing plate be used, such that any liquid passing to the top of the drum must pass near the outer periphery, then, by collecting the upper portion from openings further from the centre of rotation than the openings for collecting from the lower portion, the liquids will be found to have separated out, the heavier one discharging from the upper openings.

Another important feature is a number of thin perforated plates placed near one another. These have the effect of preventing eddies and of causing a dragging action on the liquid moving near them and add considerably to the efficiency of the separation. This kind of machine, together with others which we shall consider, are all much smaller in diameter than any of the previous types, and due to this it is possible to obtain much higher speeds proportionately and, therefore, a much greater centrifugal action than in the larger machines. At first sight, this is now obvious, but when it is realized that the stress in the rotating shell is proportional to the square of the revolutions multiplied



Electrically Driven Centrifuge for Separating Liquids of Different Specific Gravity.

by the square of the diameter, and, as stated previously, the centrifugal action on loose material is proportional to the square of the revolutions multiplied by the diameter; then, for equal shell stresses, the centrifugal action on the materials varies inversely as the diameter, but in addition to this, rotating drums of small diameter can be made from special unwelded steels, and hence, the shell stress, and therefore the speed of rotation, can be greatly increased above the corresponding ones for larger machines.

Sharples Super-Centrifuge.

In the Sharples Super-Centrifuge the rotating drum is 4 inches diameter and the speed 17,000 revs. per min. Applying the formula we find this gives a centrifugal effect of 16,400 times gravity. Comparing this with an ordinary 36-inch hydro-extractor we see that the effect is 26.6 times as great. In the 2-inch diameter machine the speed is 40,000 revs. per minute, giving a centrifugal effect 45,400 times gravity.

It is claimed, with apparent justification, that these are the highest values of centrifugal force used in practice. The care required to balance such machines and to allow flexibility of swing will be readily appreciated. With the smaller machine it is stated that sub-microscopic particles can be removed and such difficult separations as that of serum from blood can be efficiently performed. The passages through which the liquids flow are necessarily small in machines of this type and with even very small quantities of particles of certain kinds of solids these passages soon choke. In such cases a very excellent plan, which has been patented by a firm in this country, is to use a much larger imperforate hydro-extractor, as previously described in this lecture, first as a roughing machine. This will remove a considerable quantity of fine solid particles and also part of the liquid to be recovered and the remaining liquid is then treated in the Sharples Super-machine. In this way it was found that instead of cleaning the Sharples bowl every hour it was only necessary to clean every 24 hours and although it is not a difficult matter to do this and a spare bowl can be refitted in five minutes, yet in the case mentioned the two machines made all the difference between a commercial success and a commercial failure.

Of course there are very many applications in which the above difficulty would not occur. The case of separations of liquids of small difference of specific gravity will occur to everyone and an ingenious method of continuously discharging solids by means of a carrier of liquid of greater specific gravity than that in which the solids are suspended, has been developed. An example is the continuous separation from mineral oil of the wax contained therein. How far this is successful I am unable to say.

The De Laval Centrifugals work on the same principle as the Sharples Super-Centrifuge, but are larger in diameter and rotate at a lower speed. The force exerted is 6,000 gravities and the speeds 6,000 to 8,000 revs. per minute depending on the size.

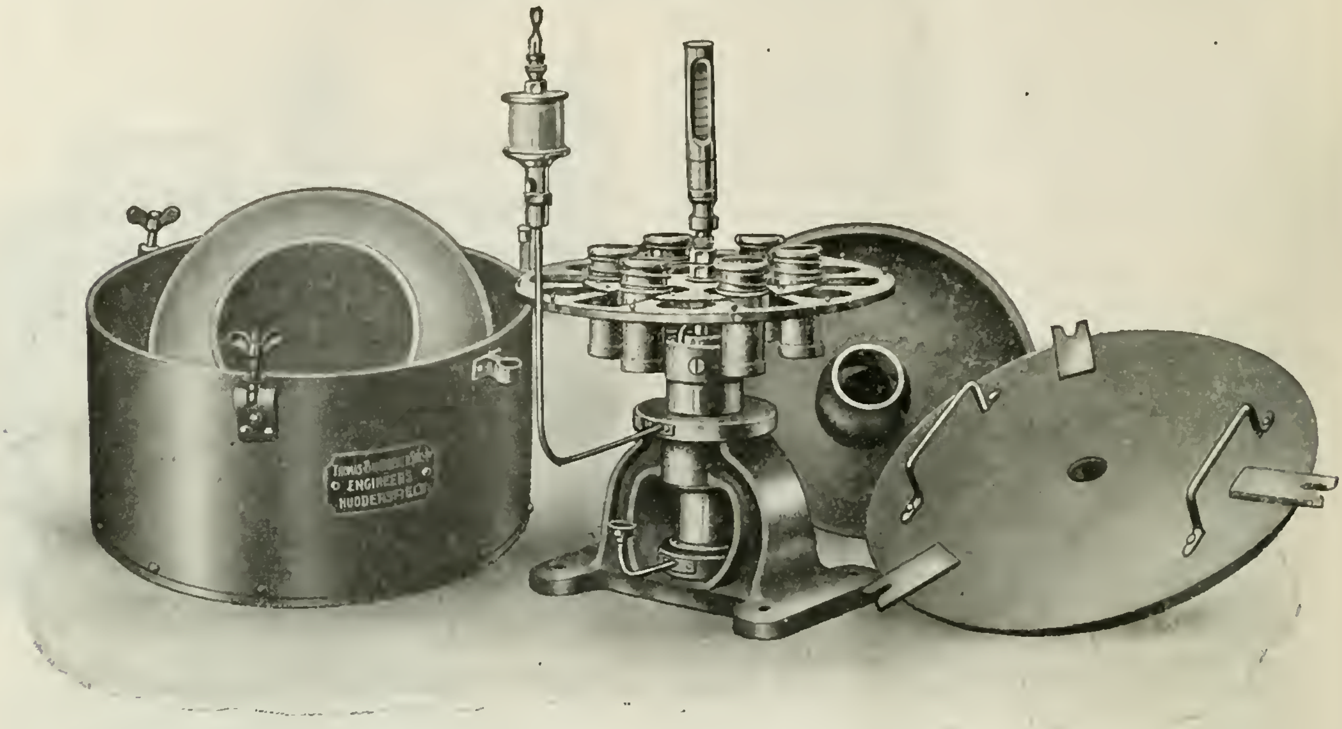
There are three general types of machines, namely, the No. 200, with a capacity of dealing with from 8 to 36 gallons of liquid per hour, the No. 300 machine, dealing with from 90 to 120 gallons of liquid per hour, and the No. 600 machine, dealing with from 150 to 350 gallons of liquid per hour. It should be borne in mind that these figures relate to the amount of liquid which is fed into the machine and not to the results, which are, of course, dependent upon the viscosity of the liquid to be treated and the amount of impurities which it contains and which it is desired to remove.

Experimental Centrifuge for Pre-determining the Nature of Liquids, Type No. 42.

One of the great uses to which these machines are put is the purification of oil. The mechanical details are carefully designed and manufactured, but it will be noticed that there are three discharge covers and openings instead of the two only as seen in the other machines we have considered. The third is known as the overflow cover.

If at any time the bowl should become clogged by a large amount of dirt so that the liquid can no longer flow through, the inlet tube fills up and overflows into this cover. This keeps the overflow separate and acts as a warning signal that the bowl needs cleaning. At the top is the regulating cover into which the liquid to be treated flows before it passes into the bowl.

The rotating bowl has perforated discs and the internal diameter of the lower portion of the bowl is greater than that above. In this recess solids heavier than water are deposited. It can be readily shown by theory that where two liquids are being separated as in the types of machine under consideration there is a perfectly definite cylinder of separation between them provided the discharge openings are free. From this it follows that no matter what the proportions of the two liquids, each will constantly discharge from its own opening if sufficient mixture was originally introduced to begin the process. Even if afterwards only one of the liquids is fed into the bowl it will be discharged from its proper opening and not from the other. The De Laval Machine has proved this in actual practice.



Interior Parts of Laboratory Centrifuge, Type 42.

In some installations of De Laval Machines where oil is recovered from swarf or from greasy waste, etc., the first step is a special hydro-extractor in which hot steam is admitted to the material to be cleaned and one of the best methods for doing this is by a steam turbine driven centrifuge, the exhaust steam of which passes through the material and the cage perforations. With a Sharples machine where a machine for fine work is used it is sometimes necessary to instal a rough-machine.

For Research Work.

For research work and preliminary investigations, two machines are worth mentioning. The first is a 9-inch machine, and can be fitted with any type of cage. If a cage requires changing this can be done in a few minutes. Skimming apparatus, heating coils or other accessories can easily be fitted and it is certainly advisable for research work to have a machine with different fittings suitable for all kinds of substances. The speed should also be variable and care must be taken if a larger machine is to be installed from the results of experiments with a laboratory machine to run this machine at a speed giving the same centrifugal effect as the larger one.

Another very important laboratory machine for analytical work consists of a number of steel swinging cups rotated on pivots on a steel disc. When the speed increases the axis of the cups becomes horizontal and the forces on the pivots would soon be abnormally great. To overcome this difficulty the support is through springs which become compressed and allow the cups to move bodily outwards so that finally the bottom of each cup rests on the periphery of the rotating disc. Small beakers can be placed in the cups and by the simple device of placing liquid of the same specific gravity as the liquid under test outside the beaker to the same level as that inside there is no danger of them being broken by the stresses set up by centrifugal action.

GIVE STUDENTS PRACTICAL TRAINING.

The Hollinger Consolidated Gold Mines, Ltd., who operate the well known Hollinger Mine at Timmins, Ont., are to be congratulated on their action in taking on over forty mining students for work at their mine during the summer months of 1921. The practical knowledge the students will obtain will be most valuable, and the Hollinger Company in turn will benefit greatly from the intelligent scientific methods of work of the students.

NEW MATCH FACTORY FOR CANADA.

During the fall of 1920, Maguire, Patterson & Palmer, Ltd., commenced the building of their new match factory at Pembroke, Ont. The plant has been completed, machinery installed, and they are now operating on a small scale. As soon as further machinery arrives and is installed, it is the intention to operate the plant to full capacity.

RECOMMENDS SURVEY OF CANADA'S COAL RESOURCES.

Evidence heard before the Fuel Committee of the Dominion Parliament, Ottawa, sitting April 13th, stated that while provincial fuel controllers pleaded with the United States Fuel Administration, for adequate supplies of coal, Nova Scotia coal operators were shipping to Holland and Denmark. Bituminous coal was shipped from Pennsylvania and West Virginia to Quebec. Mr. S. J. Cook, chief of the Mining, Metallurgical and Chemical Section, Dominion Bureau of Statistics, urged on the committee the necessity for a survey of the entire coal situation in Canada, and stated that were Nova Scotia given time and money for proper development of its mines, it could produce ten million tons of coal annually. Of the some 300 small coal mines in Alberta, said Mr. Cook, many were operated by ignorant foreigners, who were ruining the value of their properties by poor methods.

Historical Summary of the Development of the Teaching of Chemistry at the University of Toronto

With Special Reference to the Faculty of Arts*

By L. E. WESTMAN.

THE Department of Chemistry is one of the original seven with which the University of Toronto, then King's College, opened in 1843; of the other six, Classics, Mathematics, and Anatomy, retain their original designations, Belles Lettres has adopted the more homely title, "English," and special arrangements have been made for the teaching of Divinity and Law.

The first Professor was H. H. Croft, a friend of Faraday and pupil of Mitscherlich and Rose; for nearly thirty-eight years he served the University and the Province, while as Editor of The Chemical Gazette, one of the first members of the London Chemical Society, he took his part in the development of Science. Many of Croft's original preparations, first described in these Journals, are treasured on the shelves of the present laboratory, and his share in improving and extending the methods of toxicology is widely known. While Liebig was laying the foundations of laboratory instruction in Germany, Croft was doing the same here. His laboratory, now used as the Senate Chamber, which forms one of the chief architectural features of the main building of the University, was built, at Croft's suggestion, on the lines of the old Monks' kitchen at Glastonbury.

Croft's successor was Professor W. H. Pike† of Oxford and Berlin, where he studied under Miller and Hofmann. He, too, has left a lasting impress on the department and the University. The establishment of the honor course in Chemistry and Mineralogy, now the oldest science course in Arts, with its prescription of chemical research as an integral part of the undergraduate work; the introduction of the balance and quantitative experiments into elementary chemical instruction in place of the time-honored "test-tubing," and the erection of the "new" chemical laboratory in 1894, all were accomplished during his professorship.

Shortly after Professor Pike's appointment, the work of instruction in Applied Chemistry was transferred to Professor W. H. Ellis, a pupil of Croft's, who also inherited Croft's work in toxicology. To those who consider University Extension work as something peculiar to this generation it may be news that in 1880 Professors Pike and Ellis, with the assistance of Mr. (now Dr.) F. T. Shutt, gave evening courses in Chemistry to a class of one hundred and forty-one "artisans, workmen, and others;" while the present Faculty of Engineering is the lineal descendant, through the "S.P.S.," of evening lectures given at the Mechanics' Institute, by Professors Ellis, Loudon, and Galbraith.

In 1898 Professor Pike resigned, and in 1900 Dr. W. R. Lang of Glasgow was appointed Professor of Chemistry, with the new title, "Director." Applied Chemistry had long been organized as an independent department under Professor Ellis, and the new department of Physical Chemistry was created under Professor W. Lash Miller.

PROFESSOR W. LASH MILLER
Head of the Department of Chemistry.

All three have seats on the University Council, which under the University Act of those days consisted only of ex-officio members and of "the senior professor in each department of the several faculties." In 1904 a fourth department, that of Electrochemistry, was founded by Professors T. R. Rosebrugh and Lash Miller, and began work in Professor Chapman's old laboratory in the basement of the "S.P.S." building. By the generosity of Professor Ellis, who gave up space intended for his own work, accommodation was later provided and laboratories equipped in the Chemistry and Mining building, then under construction, where the two professors shared the same private room and jointly conducted the work of the department. A few years later, however, the growth of the University made it necessary for Professor Rosebrugh to devote the whole of his time to the Department of Electrical Engineering.

In 1909 the four departments, Chemistry, Applied Chemistry, Physical Chemistry, and Electrochemistry, each retaining its own budget, were united under Professor Ellis as head. Thanks to Professor Ellis' acknowledged mastery of the science, his wide sympathies, and his kindly nature, this arrangement worked without friction to the day of his death. While Dean of the Faculty of Applied Science, and with his approaching resignation in mind, Professor Ellis took steps towards the future organization of the group. Chemical Engineering was split off as an independent department under Professor J. W. Bain, whose wide experience in chemical plants, both at home

*Reprinted from article prepared for University of Toronto Monthly," March, 1921.

†News of the death of Professor Pike, in England, early in March, has been received since this article was written.

and in the United States, peculiarly fitted him for the post, and assistant-professorships of Analytical Chemistry and of Electrochemistry were created in the Department of Chemistry.

It is a long established tradition in this University that chemists should be interested in warfare. In 1861, at the time of the Trent Affair, Croft raised the first University Rifle Corps, of which for many years he was the popular commanding officer; Ellis as a member of the University Rifle Company, was wounded at Ridgeway; Lash Miller served as captain of the University Rifle Association; and soon after his appointment Lang organized the "Second Field Company of Canadian Engineers" as a University Company. During the war, Professor Lang served on the General Staff of the C.E.F., and now, as colonel, has undertaken the organization and development of a University Department of Military Studies. Colonel Lang has resigned his title of "Director," but keeps up connection with the Department of Chemistry through his lectures on Inorganic Chemistry to the students of the Faculty of Medicine.

At the present time the staff of the Department of Chemistry consists of: W. Lash Miller, Professor of Physical Chemistry; F. B. Allan, Professor of Organic Chemistry; F. B. Kendrick, Professor of Chemistry; J. B. Ferguson, Associate-Professor; L. J. Rogers, Assistant-Professor of Analytical Chemistry; J. T. Burt-Gerrans, Assistant-Professor of Electrochemistry; W. S. Funnell and W. H. Martin, Lecturers, and some fourteen half-time assistants, including graduates from New Brunswick, Saskatchewan, British Columbia, Nebraska, Utah and Ohio, as well as from Toronto. These assistants are all engaged in chemical research as candidates for the degree of M.A. or Ph.D. All told, there are some thirty research students working under one or other of the professors in the department. The most recent appointment to the staff, that of Professor Ferguson from the Geographical Laboratory, was necessitated by the recent great expansion of this side of the work.

Over fourteen hundred undergraduates from all faculties of the University last year received instruction from the department; and it is the constant endeavor of the members of the staff, by consultation with their colleagues, to adapt the work in Chemistry to the requirements of the various groups of students. Only by such team-work among the departments can the work of each undergraduate be made a well co-ordinated whole, and only so can the University be kept from breaking up into a group of unrelated units.

Students desiring the most thorough training in the science of Chemistry that the University affords, enter the honor courses of "Chemistry and Mineralogy" or "Chemistry." The most important feature of these courses is the regulation in force for thirty years, under which the laboratory time of the fourth year is devoted to "the prosecution of chemical research." Not only is this provision a natural step in the evolution of the University from an institution of the High School type to that of the European University, but the sight of their own students' flounderings when confronted with the necessity of accomplishing anything "original" has been a constant spur to members of the staff to improve their teaching in the lower years. In these courses the principles of the Science are based on a sound knowledge of Mathematics, and both in Physical and Inorganic Chemistry stress is laid on a clear understanding of what are generally considered to be the "most difficult" conceptions; the student is thus fitted to work out details for himself, and to meet new situations as they arise.

Many of the graduates have gone into academic work, sixteen of them are heads of departments in Universities of England, the United States and Canada, exclusive of Toronto. In recent years a larger proportion have gone into industrial work; many are engaged in the scientific bureaux of the Dominion and Provincial Governments; some in law, finance, farming, newspaper work, and in publishing companies. To mention only a few by name, the list may begin with the late Robert Kennedy Duncan, of Mellon Institute fame, chemist and author; J. W. McBain, whose professorship of Physical Chemistry at the University of Bristol was the second to be created in the United Kingdom; and H. R. Carveth, for many years manager of the Niagara Electrochemical Co.; while L. V. Redman, recently chairman of the Chicago Section of the American Chemical Society, and S. Dushman of the research department of the General Electric, are former members of the staff.

Chemical Society News

PROFESSIONAL MEETING OF INSTITUTE, TORONTO, MAY 13TH.

A Professional Meeting of members of the Canadian Institute of Chemistry will be held in Toronto, Friday, May 13th.

The session will be called at 10 o'clock, in the Mining Building of the University, and the day spent hearing papers and informal professional talks.

Two main addresses will be given, one by Dr. A. Hunter, of the University of Toronto, on some aspects of Modern Physiological Chemistry, and one by Dr. A. Stansfield, of McGill University, on the Electric Furnace. Electric furnace equipment at the University has been considerably extended, and chemists will have some opportunity to see this in operation.

Those attending will meet together for lunch and dinner at Hart House.

Following the main addresses, it is expected that an opportunity will be given all present to introduce professional matters, or work they are doing, which may be thought of interest.

Not only are the members of the Institute urged to be present, but all chemists are invited to join in this professional gathering. It is the wish of the local members that this be the beginning of a series of meetings, where chemists will have every opportunity to discuss matters of peculiar professional interest.

MEETING OF QUEEN'S CENTRE, CANADIAN INSTITUTE OF CHEMISTRY.

Two meetings of the Institute have been held at Queen's University. The first was addressed by W. A. Schorman, of the British American Oil Co. Motion Pictures illustrating the complete industry were shown. On April 1st, A. F. G. Cadenhead gave an illustrated lecture on Shawinigan Falls.

Queen's must be congratulated on the way they have organized the first branch of the Canadian Institute of Chemistry. The members of the staff have worked steadily to this end, and the result is that their students will be able to hear men from different lines of industry more frequently. Practically all students in chemistry at the University are much interested in becoming student members as the well attended lectures indicated. One more force has been developed which is well designed to present the value of applied chemistry in industrial life as far as the Kingston district is concerned.

MANITOBA CHEMICAL SOCIETY.

On March 10th Professor J. F. DeLury gave a most interesting lecture before the Manitoba Chemical Society on the "Mineral Resources of Manitoba." As an introduction to the discussion of his subject, the speaker gave a brief account of the geological history of the province. The prairies have experienced many "ups and downs," and for long periods were covered by the sea. It was during these repeated submersions that the older granite was covered by deep deposits of limestone, and when other sedimentary rocks such as sandstones and shales were formed. From such comparatively recent deposits, building stones, gypsum and clay products are now obtained. Since lead and zinc are found in the limestones of the Mississippi territory, where conditions are very similar to those which existed in Manitoba, it is possible that these metals also occur here. So far as is known at the present time, however, the metalliferous ores are confined to the pre-cambrian formations.

Turning to the districts in which minerals have been found, Professor De Lury first spoke of the mineral belt north of The Pas, which extends from the Saskatchewan boundary to the Hudson's Bay railway. Gold, silver and copper have been found in this area. At the Flin Flon Mine there is a body of copper ore which at the lowest estimate weighs 16,000,000 tons, and which can be mined at a profit of at least $1.00 and perhaps $2.00 or $3.00 per ton.

At the Mandy Mine, a few miles south of the Flin Flon, a high grade copper ore has also been found. It was from here that 25,000 tons of ore were shipped to the smelter at Trail, B.C., during the war period. Some idea of the transportation difficulties which hinder the development of the district may be obtained from the fact that this material had to be hauled about forty-five miles on sleighs, and then carried for one hundred and sixty miles on barges to The Pas before shipment by rail. Surveys have now been made and it is hoped that in the near future a branch line will be constructed from the Hudson's Bay Railway to Flin Flon.

The most important gold camp in The Pas belt is the Rex Mine at Herb Lake. Here the gold bearing rock has been traced at the surface for over 2,000 feet, with an average width of three feet. Six hundred feet of development work in the shafts and drifts of this mine yielded as much as $30,000.00.

In the Rice Lake district, which lies between Lake Winnipeg and the Ontario boundary, gold has been found at a number of points during the last few years, and a considerable amount of development work has been done at various claims. While there is a possibility of this district becoming one of the great gold producing regions of the world, at the present time it can only be regarded as a prospecting camp where all the indications are promising and invite further investigation.

At Bear River, copper and nickel have been discovered, and in this connection Professor De Lury drew attention to the interesting fact that the rocks in which these metals occur are similar to and probably of the same age as the metal-bearing deposits of Sudbury and Cobalt and in Michigan.

Gold was first discovered in Manitoba near the Lake of the Woods and claims were staked in this district between thirty and forty years ago. The district is still receiving attention, many metals, including molybdenum and tungsten, having been found, though so far not in sufficient quantity to warrant the expenditure of much money in development work.

At the conclusion of the lecture, which was illustrated throughout by a large number of excellent lantern slides, many of which had been made from photographs taken by Professor De Lury during his visits to the districts described, a short discussion took place, and the meeting then adjourned for refreshments.

A. W. ALCOCK.

Secy., Manitoba Chemical Society.

APRIL MEETING, MANITOBA CHEMICAL SOCIETY.

The Manitoba Chemical Society closed its season for 1920-21 on the evening of April 6th, when Mr. D. Binnington gave an exhibition of chemical magic. Mr. Binnington claimed to have discovered secrets of nature which have remained hidden from the world since Egyptian sorcerers practised their arts in the temples of Isis. He displayed his powers over the spirits of earth, air, fire and water, and under his spell the already weakened foundations of physical science seemed to crumble away entirely. That Mr. Binnington was able to mystify a highly observant and critical audience must be regarded as evidence of the power of his incantations, or the care with which the many experiments had been prepared and the manipulative skill with which they were executed. Whichever it was, he was very successful in providing an evening's diversion and entertainment.

A. W. ALCOCK, Secretary.

AMERICAN OIL CHEMISTS' SOCIETY TO MEET IN CHICAGO.

The annual convention of the American Oil Chemists' Society will be held May 16th and 17th in Chicago, with headquarters at the Congress Hotel. Among the prominent chemists who will address the Oil Chemists is Dr. C. L. Alsberg, of the U.S. Bureau of Chemistry. The entertainment committee, with Mr. L. M. Tolman, chief chemist of Wilson & Co., as chairman, have planned numerous excursions, besides the usual banquet which will occur on Tuesday evening.

As there are a great many chemists in and near Chicago interested in edible and technical oils and fats, the attendance promises to be larger than usual this year.

Mr. Thos. B. Caldwell of Wilmington, N.C., the secretary of the society, will be glad to furnish anyone interested with further details of this big event.

NEW MEMBER OF INSTITUTE.

Mr. Ossian Gardiner Lye, of the Malt Products Company, Limited, Guelph, Ont., has been accepted as a Fellow of the Canadian Institute of Chemistry.

BOOK REVIEWS

"THE CHEMISTRY OF SYNTHETIC DRUGS."

By Percy May, D.Sc. Third Edition. Longmans, Green & Co., London and New York. 248 pp. Price, $4.25, U.S.A.

Before 1914, the manufacture of synthetic drugs was confined chiefly to Germany. Since that time, an army of chemists and medical men have taken up the field elsewhere, urged by the stimulus of demand and the path taken by the introduction of gas warfare.

The result has been a spread of knowledge, and there are few drugs which have not received more or less close study during the period. Generalizations in the modern science of pharmacology are to a certain extent appearing as fundamental organic research proceeds. When it has once been admitted that there is probably as great a chemical difference between yellow and red phosphorus, as between acetylene and benzene, if we had the means of accurately investigating the molecular complexity, there is opened up a field for progress not generally recognized by previous schools of medicine or chemistry.

There is nothing stinted in the way the author discusses what is known about the chemistry of synthetic drugs and their affect on the organism. A fundamental grasp of the principles of organic chemistry is brought to the specific subject under discussion and each chapter indicates a balanced consideration of the facts. There is a smoothness about the presentation which makes the book most readible, and a vast amount of chemistry and formulae illustrating synthetic preparations. Over 900 chemicals and drugs are mentioned in one way or another, which would seem to cover the field for all practical purposes.

The fact that previous editions have met with success would indicate that the general principles of the presentation have been found valuable. This edition uses information now issued by the British Government with regard to some war time investigations. Few works yet written have so much in common for the medical practitioner whose training allows him to join in his reading with the analytical or manufacturing chemist specially interested in this field.

"Silica and the Silicates."

By James A. Audley, 359 pp. Bailliere, Tindall & Cox, London. Westman Press, Toronto. Price, $4.00.

There have been few, if any, books published, covering the same range of subjects as the author has treated. The complexity of silicate compounds has given rise to a remarkably large number of industries, many of which have been basic to industry for ages. The application of modern science to the silicates has increased the number of special silicate products on the market.

From all this mass of chemical and industrial data, generally found widely scattered, the author has built up a very fair summary of information. Certain processes have been stressed because of their industrial importance. Glass making and the use of enamels is thoroughly treated. Practically all branches of ceramic industries are given some mention and many processes are fully detailed.

OVERSEAS AND FOREIGN INDUSTRIAL NEWS

(Special Corresondence to Canadian Chemistry and Metallurgy. By Our London Representative.)

Iron and Steel Situation in Europe.

Prices are being reduced again and again. Spanish ore is a pound per ton below what it was a year ago and wages have declined. It is estimated that in England a lowering of the cost of fuel would have been sufficient to start a real movement. In the northeast of England steel billets were reduced within a few weeks £4 a ton and ship plates £2. With business small continental production rules the field. Belgium has some idle plants, notably the new mills at Chatelieneau. The French production remains stationary, with no further price reductions. Germany seems unable to reduce her prices further. Germany is getting most of the orders for railway material, although very little is passing. The German coal situation is not good, as miners are maintaining wages and forcing the price of coal even higher in some districts. The steel industry federation in Germany is having internal difficulties, due to its joint composition of workmen and manufacturers.

In both Sweden and Norway the iron and steel industry shows great depression. In January, forty-two out of one hundred and thirty-two blast furnaces were working. For the first time in history Sweden imported more wrought bar iron in 1920 than she exported. In Spain local interests are pressing for higher protective duties, as they are unable to meet any of the other manufacturers.

Lead Coating.

A company known as the Scottish Lead Coating Co., Ltd., Graham Street, Leith, has been organized to operate Morrison's patent process for coating steel with pure lead.

British Control of Synthetic Drugs.

The Ministry of Health has issued a report upon the methods by which effective control of synthetic drugs may be undertaken. Those not in the B. P. formerly had to pass tests of the Medical Research Council. Now a system of licensing is recommended. Both manufacturers plants and finished products will be inspected and samples taken. Foreign drugs below standards of British manufacturers will not be imported.

British Glass Trades.

While reports indicate that inquiries have been fair, the fact remains that there is much unemployment. The flint-glass makers are in best condition. Bottle making is slow, and many glass blowers are idle, along with cutters, plate glass bevellers and pressers.

Dyestuff Regulations.

Under the British Dyestuff Act, synthetic organic colors or pigments containing a percentage of synthetic dyestuffs require import licenses. A most exhaustive list (some 800) of possible intermediates has been made.

Fuel from Coke-Oven Gas.

The Skinnin Grove Ironworks reports that a yield of 1.6 gallons per ton of carbonized coal is being obtained by their alcohol process. Their full capacity would be 18,000 gallons per week. Alcohol and benzol are being produced together with the idea that the mixture may be used direct.

French Glass Industry.

The Compagnie Industrielle des Virreries a Vitre, with a capital of 14,900,000 francs, is building a factory at Cus-

sett, in the Allier Department, to manufacture window-glass by the Foureault process. This is considered a most important addition to French industry.

French Water Power.

Mr. Bailley, discussing developments before French engineers, states present French water power at one and a quarter million horsepower. There seems to be a rapid development in progress in these lines in France. Some forty-nine companies have been formed in the last two years to develop French water powers and some 450 million francs are invested.

Norwegian Molybdenite Industry.

This industry has not fared well since the war. Both England and Germany so stimulated production there that some thirty mines were opened. The situation is the same as elsewhere. Reserves of ore are available if a demand should ever occur. The capital invested is estimated at 20 million kroner, which is a large amount to lie partially idle.

Wood Distillation in Japan.

This was a Japanese war industry, stimulated by the necessity of acetic acid for rubber planters in the East. The Calcium acetate market in Japan is uncertain. In 1913 it was 4,049 long tons; 1916, 577 tons; 1919, 5,398 tons. Since 1916 United States has had this market for the most part. Acetone is in demand to 600 or 700 tons per annum. The local production of methyl alcohol has been decreased and the rise and fall of this industry may be measured by its exports of acetic acid to Strait Settlements. There were, 1915, 669 tons; 1917, 2,137 tons; 1919, 890 tons, and less in 1920.

Menthol and Peppermint Oil.

Japanese production and export of these substances allied in their source has had a remarkable rise and fall. The menthol is obtained as a residue in refining the oil distilled from a variety of peppermint. Production reached a peak in 1916-17, when about 250 tons of menthol and the same amount of peppermint oil were recovered. Menthol at that time was 10s. per pound and peppermint oil 3s. per pound. Last year production went down to about 118 tons and exports decreased by a much higher proportion. The price increased about four times.

Soap from Coquito Nut Oil.

Mexican manufacturers have so taken to the use of Coquito nut oil in making soap that the price of these nuts has risen from $40 to $250 per ton. Annual production is about 5,000 tons, the whole amount being consumed in Mexico.

Mexican Petroleum Exports.

During 1920, Mexico exported 15,000,000 barrels of petroleum. Probably from one-half to two-thirds of this went to the United States. There were 1,056 producing wells operating in November.

Iron and Steel in New Zealand.

New Zealand is considering her iron and steel situation. In 1914 a plan of bonuses was established under the Iron and Steel Industries Act. This is now being revived. To date no one has been successful in starting operations of any size. Iron sand, and limonite ore of fair quality is available in large amounts. The Government is being pressed to make this Dominion more independent of foreign supplies and a full survey of iron ore resources will be undertaken.

Oil Industries in Dutch East Indies.

A very rapid development is taking place in Dutch East Indies. Most of the mills are in Java. Some fourteen of them have a capacity of 250 tons of crude oil per month. They are working for the most part on copra. There are many small oil mills belonging to Chinese and Natives. Besides copra, smaller amounts of ground nuts, castor, kapok, and palm oils are being produced. The oil palm plantations are in Sumatra's east coast.

Chinese Soda Market.

English or British plants supply a high percentage of Chinese requirements in soda ash, caustic soda and bleaching soda. About 50,000 tons of soda ash represents the annual market in China. Japan is not in a position to supply caustic soda.

Iron and Steel in the United Kingdom.

The iron and steel trades began the new year very confused in details, but with good forward prospects, though several months must elapse before there is any great activity. Hungry customers, or would-be customers, cannot afford to place big orders at prevailing high prices, with an extremely artificial and uncertain international exchange, and with severely restricted credit facilities. Producers are hampered with heavy labor and raw material costs, excessive and indefinite taxes, and fantastic foreign exchanges. On the other hand, the German mark is so depreciated that it requires 256 to equal the English £. This makes successful competition with Germany impossible in any line in which Germany has goods to offer. On the other hand, an 88 per cent. premium on the United States dollar, averaged over sixteen countries, renders American competition very weak. Until a nearer approach to normality can be effected, long-date contracts are practically out of the question. Still there is a world steel famine unsatisfied, and Britain is in the best physical position for export trade. Shipbuilding is pronouncedly on the decline, and makers of shipyard material may look for a lean year or two. On the other hand, demands for railway material will be healthy for very many years. Agricultural implements and constructional steels will be healthy lines for years to come. Taking the long and broad view, three big points can be seen:—(1) A world extremely hungry for steel goods, (2) very little foreign competition as we knew it in pre-war days, and (3) signs of more settled labor and more sane finance.

Following the restriction of production in October and November, on account of the coal strike, works got well going at the beginning of December.

Thus, in spite of big iron shortage, we have managed, aided by unusual quantities of scrap, to make about 9,000,000 tons of steel in 1920, against our best pre-war record of 8,000,000 tons. Our pig iron output has, of course, been 2,000,000 tons below the best record.

British Exports of Iron and Steel and Manufacturers thereof (exclusive of Cutlery, Hardware, and Engineering Products) eleven months:

	Tons.	Value. £
1913	4,603,243	51,183,899
1919	2,003,793	57,304,052
1920	3,062,833	119,634,626

During the last few weeks of the old year we saw a series of steel price reductions, ranging from £5 to £12 per ton, though there were only small declines in pig iron.

Foreign competition talk must once more be dealt with. Things are being exaggerated. We are told that the Germans and Belgians are working at high pressure and trading at low prices; that France is now the world's second steel country; that the Americans are cutting us

out; and that even our own Colonies are building up great steel industries. First, about Germany. Germany has lost the Lorraine. In no iron district left to Germany has production in 1920 exceeded 50 per cent. the pre-war rate. The export bounty and subsidy system, under which Germany built up her huge foreign steel trade prior to the war, is smashed. Only in light lines—and in these by means of a fantastic exchange and abnormal quantities of munitions scrap steel—is Germany able to offer competition worth mention. In the first eleven months of 1920 we have imported 37 tons of German steel—against nearly a million tons a year before the war.

Secondly, Belgium. In 1920 the daily average output of pig iron in Belgium has barely reached 3,000 tons, against 7,000 tons before the war. Not more than half the Belgium iron and steel producing capacity, destroyed by the Germans, has yet been restored. If and when Belgium gets going at full capacity, her total output, if every ton is exported, will not mean more than a drop in the bucket of international trade. And the net cost of producing a ton of Belgian pig iron is 500 francs. A small quantity of Belgian steel is being offered at attractive figures, because it is taking 55 Belgian francs to equal the £ English, against 25 francs normal. In face of all the talk these late months about Belgian competition, we have only imported into this country 21,000 tons of Belgian steel in the eleven months, January-November.

Thirdly, France. France has secured the rich Lorraine; but she has neither the labor to produce, or the railways to carry, nor the docks to ship, more than a fraction of the heavy iron and steel exported by Germany before the war. With the Lorraine thrown in, France is not producing half the tonnage she produced without the Lorraine before the war.

Finally, there is America. All that is said about the resources of the United States may be true. America may possess the most coal and ore, and may have the biggest furnaces, and the lowest railway rates, per mile. But nothing can destroy the fact that such enormous distances separate the American ore from the coal, and the furnaces from seaports, that America cannot compete successfully with little Great Britain on anything like level terms in the exportation of heavy goods. Physical and geographical conditions are against the United States in this line. And there is the economic factor of the exchange. A country which supplies practically all its own wants within its own four corners, requiring to import very little of anything from anywhere, cannot long carry on a great export trade. Exchange will not permit. America is the greatest internal trading country, but she cannot permanently be the greatest external trading country—not in heavy steel, at all events.

The British Glass Industry.

Irregular conditions continue to characterize all sections of the glass trade. Unemployment is increasing almost daily, especially in those sections established or rehabilitated during the war period at the behest of the Government.

This country, however, has always held a monopoly of high-class hand-made glassware, and hitherto that position has not been seriously assailed. It is with some misgiving, therefore, that those interested in hand-made glassware learn of the progress Belgium in particular is making in this branch. The ingredients used in the manufacture of this ware have necessarily to be of the highest quality procurable, but these have not always been obtainable during the last few years. Belgium is just now exporting enormous quantities of glass, and she is already a formidable competitor for plate and sheet glass, while some of the high-class table ware she is just now sending over is of a very fine quality. Although potash is still four to five times its pre-war price, Belgian manufacturers are apparently obtaining very satisfactory supplies, and this has given rise to the complaint of our own manufacturers made to the Board of Trade many months ago that this country was not getting its share of this ingredient according to the terms of the Peace Treaty.

The British Dyestuffs Corporation.

The British Dyestuffs Corporation has declared a dividend on its preference shares; making the full 7 per cent. for the year 1920. The Government hold £1,700,000 of the Company's capital, half being in preference and half in preferred ordinary shares, and they have special voting powers.

Recent Chemical Developments in Germany.

A report published in a Berlin paper shows that the number of chemical plants in Germany has remained almost stationary during the period between 1913 and 1919. There were 15,042 chemical works in the country in 1913; in 1918 this figure increased to 15,204, but fell to 15,060 in 1919. These employ 544,161 part and full time workmen. The chief interest in the report is in the evidence of highly increased wages. The average annual income of a full time chemical worker in 1913 was £64, taking the mark at the normal exchange; this rose gradually in the war years until it stood at a little less than £160 in 1917. In 1919, the average wages had risen to £180, and in the course of 1920 the workers in the chemical industry were so liberally paid that there are indications that the average annual wages would reach a total of £900. This is a telling illustration of the purchasing power of the mark: the 18,000 received in 1920 probably amounted to much the same thing as the 1,266 received in 1913.

The founding of the Leuna and Oppau Ammonia Works, with a share capital of 500 million marks, is without doubt the most tremendous financial undertaking in Germany. The giant works at Leuna, near Halle, were commenced during the war, and are not yet quite finished.

The Oppau works, founded shortly before the war, are near the mother concern, the Baden Aniline and Soda Factory at Ludwigshafen. The works at Oppau and Leuna are solely given over to the manufacture of nitrogen. Their total yearly production is estimated at 300,000 tons, which would more than satisfy the needs of German agriculture for artificial fertilizers.

The enormous building expenses of these giant works up to now have been provided by the mother concerns, chiefly by the Baden Aniline and Soda Company. The State also lent considerable sums of money, which the concern now wants to pay off. The Baden Aniline and Soda Factory is anxious to fit itself for the struggle to regain its pre-war position in the world's market for aniline dyes and such-like chemical products.

There are reports that negotiations are going on for the building of works similar to those at Leuna in America and in Japan.

Interest now begins to centre round the German oil industry. As is well known, Germany has but scanty oil resources, and the German oil companies' chief activity formerly was the participation in Galician and especially Roumanian oil concerns. The Versailles Treaty has made this an impossibility.

Two German oil concerns have now increased their capital in order to exploit the domestic oil resources, but mainly to extract mineral oil from lignite according to a new process. The additional capital will also serve to stimulate foreign trade and bring about a union with a Dutch oil company.

With a view to becoming independent of the supply of hard coal, the Siegen-Solinger Gussstahlverein contemplates the erection of new plants in Central Germany in close proximity to the brown coalfields.

Preparations for the installation of an electric steel works with lignite firing have been proceeding for some time, and building operations will probably begin in the near future. Whether the whole or part of the Solingen plants will be transferred later to the new locale in Central Germany will depend upon the development of the tax and labor situation at Solingen.

A movement is on foot to amalgamate the German collieries with a view to pooling profits and increasing production. With this aim an East German Mining federation has already been founded, while Federations for Central Germany and Western Germany are being formed.

Manchurian Market For Photographic Supplies.

Until a few years ago the only photographers doing business in Manchuria were Japanese, but to-day quite a number of studios are owned and conducted by Chinese; while amateur photography is also rapidly becoming popular. As an evidence of the increased demand for photographic supplies in Manchuria, an American consular report points out that whereas the total imports of photographic goods into all China were valued at $229,851 in 1913, in 1919 no less than $223,159 worth of goods were disposed of in Manchuria, while for all China the value of the imports amounted to $1,027,054. Of this amount British supplies were valued at $466,669; while Japan and Chosen sent goods to the value of $311,093, the United States supplying $172,026, France and other countries exporting materials to the value of $77,267.

Mining and Metallurgy in British Columbia

(Special Correspondence to Canadian Chemistry and Metallurgy.)

H. S. Munro, general manager for the Granby Consolidated Mining, Smelting & Power Company, recently made an inspection of the company's various properties in the province. He stated that Grand Forks property would be closed completely by the end of the present month, and it was very unlikely that it would ever be reopened again. The Cassidy colliery, on Vancouver Island, the purchase and equipment of which has cost the company more than two million dollars, is not paying five per cent. on the investment, and the company would willingly lease it to anyone who was willing to offer a reasonable interest on the money that has been expended. The coal does not produce a satisfactory metallurgical coke. Anyox, Mr. Monro said, is the only copper smelter in the Western Hemisphere that is working at anything like capacity. There has been another cut of 25 cents per day in the wage scale, in accordance with the agreement entered into between the employees and the company last December, when a cut of 75 cents per day was made, but, notwithstanding this, wage conditions were never more satisfactory. At the present time there are 1,130 men in the company's employ, between two and three million pounds of copper is being produced every month, and development at the mine is being kept well ahead.

Large Amount of Ore Received at Trail.

During the month of March, 35,682 tons of ore were received at the Consolidated Mining & Smelting Company's smelter at Trail, bringing the total for the year to date up to 101,620 tons. Considering the condition of the base-metal market, this is rather remarkable, as the receipts for the whole of last year totalled only 383,112 tons. With the exception of perhaps a couple of thousand tons, the whole of the ore delivered at the smelter this year has come from the company's own mines, whereas last year a marked proportion was custom ore. With a view to increasing its gold output, practically the only metal in demand at the present time, the company is pushing the production at its Rossland mines, the product of which is essentially a gold ore. The output of zinc-lead ore from the company's Sullivan mine, at Kimberley, is being maintained. The company has under consideration plans for the erection of a battery of by-product coke ovens, similar to that erected at Anyox two years ago. In the past, coke used at the smelter has been obtained from the beehive ovens at Fernie. It is thought that it would be more economical to make the coke at the smelter, as the surplus gas could be used in roasting zinc concentrate, and flotation oil could be made from the creosote in the tar. A mixture of pine oil and creosote is used in separating the zinc sulphides from the iron sulphides by flotation.

Activities Among the Companies.

The Premier Gold Mining Company has let a contract to the Riblet Tramway Company of Spokane, Wash., for an aerial tramway between the mine and tide-water, a distance of eleven and one-half miles, in which there is a drop of 1,400 feet. Good progress is being made in clearing the right-of-way, and the erection of the tramway will be rushed as soon as the machinery arrives. At the present time the company is employing 200 men, but another 100 will be put to work as soon as the machinery arrives. Some 1,200 tons of high-grade ore was shipped to Tacoma by the last two boats leaving Stewart.

The foregoing companies and the Belmont-Surf Inlet Mines, Ltd., are the only metal-mining companies that are operating on a large scale at the present time. Conditions for new development work are improving. This is being shown by the deposits at the Vancouver assay office, where during the first three months of the year gold to the value of $394,244 has been deposited, as against $254,234 for the corresponding period of last year. It is being shown, too, by the number of mining properties that have changed hands recently. Important among these may be mentioned the Pioneer mine, Cadwallader Creek, Lillooet division, which is to be re-opened this spring by A. H. Wallbridge. The Mining Corporation of Canada had a bond on this mine, and did a considerable amount of work before relinquishing its option. F. F. Bradbury has bonded the Independent group, near Spence's Bridge, for $150,000. This property, which contains ores of copper, gold, and silver, has been idle for some time. R. Clothier and A. McInnis have purchased a half interest in the Salvador group, on Marmot River, in the Portland Canal division, and already have started to develop it. A two-foot vein, carrying about one ounce of gold per ton, has been exposed in three short tunnels. A Los Angeles syndicate has acquired a placer-mining concession on the Similkameen River, and will start exploration work as soon as weather conditions allow. A

Seattle syndicate has bonded the Outland group, in the Portland Canal division, and will start operations at an early date. A good deal of surface stripping has been done on the property, and some gool silver ore has been exposed.

Lessees Keep Silver-Lead Mines Going.

Though little mining is being done in the silver-lead districts by the mine owners, owing to the fact that there is no outlet for the ore at the present time and the provincial laws demand that wages must be paid not less frequently than twice a month, a good deal of work is being done at many of the mines by lessees. This obviates the semi-monthly payment difficulty, and many miners who otherwise would be out of employment, have leased portions of mines in the Slocan and other districts, and are accumulating ore until such time as it becomes saleable. Thus, for example, at the Florence mine, in the Ainsworth district, lessees have more than 500 tons of clean ore ready for shipment when the opportunity offers, while at the Standard mine, in the Slocan district, lessees recently sent two cars of ore to the Bunker Hill and Sullivan mine, at Kellogg, in Idaho. This plan has the double advantage of keeping the mines in a condition in which they can be restarted by the owners readily when the conditions justify it, and keeping a considerable number of men employed.

Fluorspar Mine Closed Indefinitely.

The Consolidated Mining & Smelting Company has closed its Rock Candy fluorspar mine and mill for an indefinite period. The closing was caused by the cessation of operations at steel plants at Garry, in Indiana, which took the bulk of the output of the mine. The Rock Candy mine provided 66 per cent. of the fluorspar output of Canada last year.

New Platinum Discoveries.

George Clothier, Government resident mining engineer for the No. 1 district, reports the discovery of the platinum group of metals on Morseby Island, one of the Queen Charlotte group. The platinum is found associated with bornite and chalcopyrite in veinlets in diorite. Similar occurrence of platinum was reported by William Tomlinson, of the Mineral Resources Commission, in a pyroxenite-syenite zone, locally known as the "black lead," at the Franklin camp, in the Greenwood division.

Mining and Company Notes.

The annual report of the Rambler-Cariboo Mines, Ltd., shows that water-shortage and labor troubles prevented the operation of the mine and mill for more than half of 1920. Some 4,000 tons of ore was treated, with the production of 220 tons of lead and 250 tons of zinc concentrates.

Owing to the unsatisfactory condition of the silver, zinc, and lead market, the Silversmith mine has been closed indefinitely. Production was stopped last fall, but since then some 40 men have been kept at development work.

Seepages of oil have been reported from Burns Lake, west of Fort Frazer, on the Grand Trunk Pacific, by Donald W. Gerow. It appears that the seepages were noted some time ago, and the property is to be explored by a drill.

Cheap Explosives for Prospectors.

Among the estimates in the provincial budget are: $10,000 to provide cheap explosives for bona fide prospectors; $40,300 for mine inspection; $14,645 for mine rescue and training stations; and $60,000 for oil exploration in the Peace River district. The Provincial Legislature closed its session, which had lasted seven weeks, on April 2. A great deal of adverse criticism has been caused because in the dying hours of the session the Legislature passed a bill increasing the members' indemnities and ministers' salaries 25 per cent., while earlier in the session the bonus of 25 per cent. to civil servants, which had been given to combat the high cost of living, had been removed.

NEWS FROM YUKON TERRITORY.

Arrivals at Dawson City from Mayo report a phenomenal strike of silver-lead ore on the Rico claim, owned by the Yukon Gold Mining Company. The orebody is reported to be nine feet wide, two feet in the middle of the vein is clean galena, assaying more than 200 ounces per ton in silver, while on either side is carbonate ore running nearly as high in silver. The discovery was made in the No. 9 tunnel, which has been driven into a high bluff. The ore continues to the surface, 75 feet above the tunnel, and a winze has been sunk on it for a depth of 75 feet from the tunnel. This is believed to be the richest silver-lead discovery yet made in the Yukon. The Yukon Gold Mining Company already has transported 2,500 tons of high-grade ore to Mayo Landing, and, if the weather holds, it is probable that another 1,000 will be taken to the Landing before navigation opens. The limitation is in the transportation facilities, not in the quantity of ore that can be taken from the mine.

There is likely to be a great deal of activity at the Mayo camp this year. F. W. Bradley, head of the Bunker Hill & Sullivan Mining & Smelting Company, one of the largest silver-lead mining and smelting concerns in the West, has taken options on a considerable number of claims, while other claims have been bonded to the American Goldfields Company, a subsidiary of South Africa Goldfields, Ltd., and to Chicago and English syndicates.

The Canadian Klondyke has had a force of about 70 men employed in repair work during the winter. The company owns three huge Marion dredges, which rank among the largest in the world, and it has a fully equipped repair shop, containing a foundry and an electric furnace in which scrap steel is melted and new castings are made; a complete electric-welding plant; an oxygen plant, and a thermit outfit. With this outfit the company is able to re-shoe the dredge-buckets, and in this alone the plant is said to have more than paid for itself. It must be remembered, of course, that freight charges constitute a very large item of expense in all machinery taken to the Yukon, and that scrap cast iron and steel, unless it is melted and re-cast on the spot, is valueless, as it is not worth the cost of transportation. The company has developed a large power plant, which is capable of generating 3,000 horse-power during the summer. The dredges each have a daily capacity of ten to fifteen thousand cubic yards, and it is claimed that the company owns sufficient ground to keep the dredges busy during the next twenty seasons.

The North-West Corporation, another powerful concern, owns one dredge of the Marion type and one of the Bucyrus type. Each of these has a capacity of about 4,000 cubic yards. The company owns a large concession on the Indian River and several smaller ones. F. P. Burrall acts as general manager for both companies.

BRITISH COLUMBIA INDUSTRIAL NOTES.

The Sidney Roofing Company's plant at Sidney, Vancouver Island, was completely destroyed by fire recently. The company manufactured many varieties of roofing and building papers. A new and larger plant is to be rebuilt at once.

The Hon. T. D. Pattullo, Minister of Lands, has announced that a contract has been let to Lynch Brothers of

Seattle, Washington, to sink a 2,000-foot bore-hole at the south fork of the Red River, some 20 miles northwest of Hudson Hope, in the Peace River region. The hole is being sunk on the recommendation of Professor John A. Dresser, of Montreal, who made a reconnaissance survey of the district last summer.

So great has been the demand for the bark of the Rhamnus Purshiana trees for the manufacture of cascara sagrada and so wantonly has the bark been gathered that the Provincial Forest Reserve officials have recommended the passing of strict laws to prevent the gathering of the bark by methods calculated to destroy the trees. It is suggested, too, that plantations for the culture of the tree be established in suitable locations.

F. A. Haggen has given official notice of the winding up of the Technical Press, Ltd., of Vancouver. Ernest A. Didham has been appointed liquidator.

E. A. Jacobs, a well known mining man, who for some years owned and edited the B. C. Mining Record, died recently at Morenci, California.

S. G. Blaylock and H. B. Fuller are petitioning the Lieutenant-Governor-in-Council for the incorporation of the town of Tadanac, on which the Consolidated Mining & Smelting Company's smelter is situated. The precincts named in the petition comprise some 740 acres.

The Pacific Roofing Company, Ltd., is erecting a calcining plant at the Carew-Gibson magnesite quarry at 105 Mile, on the Cariboo road. The company acquired the property last year, and expects to be in a position to provide calcined magnesia shortly. Inquiries for the product have been received from the United States and from England.

OIL REFINERY AT FORT NORMAN.

Edmonton.—The Imperial Oil Company will erect a small refinery near Fort Norman during the coming summer, to provide gasolene for the company's airplanes and power boats. The company expects to be in a position to provide other concerns with gasolene, but, of course, its own needs will be filled first.

Mineral Production, Ontario, in 1920

(Concluded from our April issue.)

Platinum Metals.—Nickel-copper ores from Sudbury carry appreciable quantities of gold, silver, platinum, palladium and other metals of the platinum group. Reports of output for 1920 are incomplete, the figures in the table representing the recovery at the Port Colborne refinery of the International Nickel Company of Canada. Recoveries made from the Mond Nickel Company's mattes have been published in a recent bulletin on Platinum, issued by the Imperial Institute of London. The figures follow: Platinum, 3,722 ounces in 1916, 4,719 ounces in 1917 and 4,958 ounces in 1918. In 1915 the Mond mattes were estimated to contain 3,078 ounces of platinum, 5,474 ounces of palladium and 973 ounces of iridium and rhodium. In 1919 from mattes of the International Company treated at Port Colborne, Ont., and Bayonne, N.J., there was a recovery of 1,770 ounces of platinum-group metals, of which 642 ounces were platinum. These figures place Ontario in third place among the platinum producing countries of the world, Russia and Columbia alone having a greater production.

Iron Ore, Pig Iron, Ferro-Alloys and Coke.

The quantity of the iron ore raised in 1920 was 187,867 tons, while ore shipments from the Magpie mine of the Algoma Steel Corporation and of briquettes by Moose Mountain, Limited, totalled 126,710 short tons, valued at $510,000. During the year 6,769 tons of briquettes worth $59,647 were shipped outside the Province, the balance going to Ontario farmers.

Of the 1,493,837 tons of iron ore smelted in Ontario in 1920, there were 1,341,661 tons imported from the United States. According to figures published by the U. S. Geological Survey, the average value of iron ore at the mines was $4.18 in 1920 as compared with $3.61 in 1919. Ontario ore smelted was 152,176 tons, or 10.18 per cent. of the total. Pig iron credited to Ontario in the table represents only a proportion of the total output equivalent to the percentage of domestic ore used. Furnaces operated at Sault Ste. Marie, Hamilton, Port Colborne, and Midland. The stack at Parry Sound belonging to the Parry Sound Iron Co., Ltd., has not been in blast since October 1st, 1919, and that of the Standard Iron Co., Ltd., at Deseronto, since June of 1919. The Midland stack was blown in on October 20th, 1920, after being idle since August, 1919. Furnaces, in addition to ore, were charged with 349,960 tons of limestone worth $535,029, and 818,698 tons of coke valued at $9,549,290. The total pig iron product was 748,173 tons, valued at $21,652,308. Steel produced was 707,692 tons, worth $26,366,524. Two new blast furnaces, each of 550 tons daily capacity, are under construction by the Canadian Steel Corporation, Ltd., at Ojibway, on the Detroit River.

In addition to pig iron and steel, the Algoma Steel Corporation at Sault Ste. Marie produced 5,496 tons of spiegeleisen. The bulk of the ferro-silicon production was by Electro Metals, Limited, at Welland. This company operates its own quartz quarry at Killarney, and produced in 1919 three grades of ferro-silicon, namely, 15, 25 and 50 per cent. There was also a small production by companies using Niagara electric power for the production of artificial abrasives from imported bauxite, ferro-silicon being a by-product. In all, 21,171 tons of ferro-silicon, worth $1,092,420, were produced in 1920.

Coke production in Ontario is growing in importance. The Algoma Steel Corporation, at Sault Ste. Marie, and Steel Company of Canada, at Hamilton, are now equipped with by-product plants, the former installation being 160 and the latter 80 ovens. At the end of 1920 there were 125 ovens in operation. During the year 1,089,024 tons of imported coal worth $8,289,388 was charged to the ovens, the products including 725,214 tons of blast furnace and foundry coke and other by-products, including domestic coke and "breeze," ammonia, sulphate, tar, gas and benzol products, the aggregate value being $10,116,296. During the year a new benzol plant was placed in operation by the Steel Company of Canada.

Lead.

With the exception of 15,661 pounds of lead recovered by U. S. refineries from Ontario gold and silver ores the entire output noted in the table was the product of the Kingdon Mining, Smelting and Manufacturing Company, with mine and smelter located at Galetta. Average lead prices for the year were 7.96 and 7.83 cents per pound, respectively, on the New York and St. Louis markets.

Non-Metallic Minerals.

Feldspar and Fluorspar.—The market for high potash feldspar in 1920 showed considerable improvement over 1919, owing to an increased demand from the pottery, por-

celain and enamelware manufacturers of New Jersey and Ohio. Production figures noted in the table are incomplete. During the year a deposit was opened up by W. B. Woods, in Chapman township, at Cecebe Lake, an expansion of the Magnatawan River. Feldspar, Ltd., did not operate its two properties near Verona, where large tonnages are available, but an effort is in progress to secure a branch line of railway for facilitating shipments. The Feldspar Milling Company, Limited, has moved its grinding mill from Tichborne to Ashbridge's Bay, Toronto. During 1920 about 33,000 tons of feldspar for export to grinding mills in the United States passed through the entry ports of Kingston and Toronto.

The demand for fluorspar has fallen off since the war, when steel makers required a large supply. Shipping conditions on the railways have improved, and Ontario spar is not without competition. Careful cobbing is necessary if barite and other impurities are to be eliminated. Ontario's production comes entirely from Madoc. Both the Perry mine and that of Canadian Industrial Minerals, Ltd., the two principal shippers in 1920, were closed at the end of the year owing to lack of a market.

Graphite.—Two companies operated in 1920, the Black Donald, at Whitefish Lake, Brougham township, county of Renfrew, and the Timmins Graphite Mines, Burgess township, Lanark county. The latter was closed until September. Shipments were made of 288 tons of crude worth $13,066, and 1,668 tons of refined graphite, valued at $119,816. The entire output, with the exception of 139 tons, was shipped to the United States. Section E of the last Summary report of the Geological Survey of Canada contains a map and description of the Black Donald mine, by M. E. Wilson. The Acheson Graphite Company, at Niagara Falls, Ontario, manufactures artificial graphite in the form of powder for dry cells, paints, etc., and also as electrodes—the total output being 682 tons.

Gypsum.—In 1920 there was only one operator, the Ontario Gypsum Company, Limited. The two mines of this company are situated in the valley of the Grand River, township of Seneca and Oneida, and the calcining works at Lythmore and Caledonia. During the year 84,178 tons were mined and milled. Crushed gypsum is used in the Portland Cement industry. The calcined product is supplied to manufacturers and roofers, while wall plaster, gypsum blocks and plaster board are used for construction purposes. Crushed, ground and calcined gypsum marketed was 45,963 tons, valued at $159,838. In the manufacture of gypsum products 28,744 tons, worth $244,324, were used.

Iron Pyrites.—With the close of the war the demand for pyrite for sulphuric acid manufacture suddenly slackened and surplus stocks of acid were not all absorbed in 1919. Although the figures of pyrite shipments for 1920 show an increase over 1919, railway transportation conditions have improved to such an extent that native sulphur from the southern States is competing with Ontario pyrite. The Nichols Chemical Company, with mines at Sulphide, Northpines and Goudreau, is the largest Canadian producer. Shipments from the latter property of 30 per cent. ore were from stockpile, the mine not having operated during the year. Ore from Northpines carrying 40 per cent. sulphur was carried by rail to Fort William docks for shipment by boat. The Grasselli Company, at Flower Station, and the Canadian Sulphur Ore Co., at Queensboro, shipped to the chemical plant at Hamilton belonging to the former company. Shipments to Sault Ste. Marie from stockpile at the Helen mine were made by the Algoma Steel Corporation. A deposit of pyrite, said to carry 46 per cent. sulphur, is being developed in the district of Rainy River at Nickel Lake, by W. A. Preston and associates. Of the total shipments, 19,528 tons were consigned to Ontario points and 129,123 tons to the United States.

Mica.—The mica production of Ontario comes chiefly from the eastern part of the Province. Returns show that sales for the year were 717 tons, worth $51,493. The large tonnage is explained by the inclusion of 427 tons of scrap and dump mica, worth $5,683. Shipments were made of 263 tons of rough-cobbed, worth $38,177, and 27 tons of thumb-trimmed.

Salt.—Production was well maintained in 1920. Brine was pumped from twenty-six wells. The ten plants in operation are all situated in the southwestern peninsula of the Province, between Kincardine, on Lake Huron, and Amherstburg, on the Detroit River. Separated according to grade the quantities sold during the year were as follows: land, 2,054 tons; coarse, 28,709 tons; fine, 39,663 tons; table and dairy, 42,474 tons. Brine with salt equivalent of 72,293 tons was used in the chemical plant of Brunner Mond Canada, Limited, at Amherstburg, and that of the Canadian Salt Company, Limited, at Sandwich. Chemicals produced include soda ash by the former company, while the latter turns out caustic soda and bleaching powder.—From Preliminary Report, Mineral Production of Ontario in 1920, prepared by W. R. Rogers, Statistician, Ontario Department of Mines.

PRESENT CONDITION OF CERTAIN CHEMICAL INDUSTRIES IN THE UNITED STATES

THE chemical division of the United States Tariff Commission has under survey practically all the important chemical products affected by the tariff. Those receiving the most detailed study have been dyes, barium products, wood chemicals, crude drugs and starch. In addition to these, many minor but none the less important lines of chemical industry have been considered, for example, the production of fine chemicals, both organic and inorganic.

The dye situation has received more attention in a popular way, and also because of its peculiar national importance. Generally speaking, the production of sulphur black and indigo has been most successful and no doubt exists that all requirements in dyes could be met if the possibilities of competition were shut out or reduced. The history of legislation designed to protect the American manufacturer of dyes is well known, and delay and opposition to such legislation has been a serious drawback from the viewpoint of the manufacturer. Something will be done in time as the national interests on the whole demand it, and England has given the lead in this direction.

Barium Products.

Previous to 1914 lithopone was the only barium product manufactured in the United States. The industry was restricted to the Atlantic Coast and practically all barytes used was imported from Germany at a price which shut out domestic barytes of the Central Western States. Germany also furnished about two-thirds of the barium chemicals. The War started the development of southern barytes, a lithopone industry in Central States and with a barium chemical industry, lithopone manufacturers in the East wish a low duty on imported crude barytes. The

Tariff Commission has shown that barytes amount to 14% of the cost of lithopone manufacture. The relation of lithopone to other pigments as well as the above, enter into Tariff considerations. Southern producers wish to hold Eastern American market for crude barytes, while Middle Western producers desire to retain the same market for ground barytes. Middle Western ore is softer and grinds more readily.

Wood Chemicals.

The wood chemical industries in the United States have had several rather serious developments to face in the production of synthetic acid from carbide, and the production of acetone from corn by a fermentation process. The export market for acetate of lime and wood alcohol has fallen off from 1,800,000 gallons (U.S.A.) to about 700,000 gallons (U.S.A.). This is an exceedingly difficult business to keep balanced.

Crude Botanical Drugs.

An unprecedented demand existed for drug products. Considerable success was made in the cultivation of belladonna and digitalis and cannabis indica, the drug from Indian hemp. Less success was made with henbane, stramonium, valerian and levant wormseed. Natural sources of supply are likely to rule this market.

Starch and Dextrine.

The textile industry is concerned chiefly. Here corn starch competes with potato, tapioca, wheat, sago, arrowroot, rice, etc. But starch has its own peculiar values. Foreign developments have left the corn starch industry supreme in the United States. Both Germany and Japan have large potato starch industries. Potato Starch pays one cent per pound duty and other starches one-half cent per pound. Both tapioca and sago are specifically exempt.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

Reported to Canadian Chemistry and Metallurgy by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Purification of Zinc Solutions.
Henry L. Sulman, Samuel Field, 209546, March 15, 1921. Zinc solutions are purified from Co by treating the solution with PbO_2 or MnO_2 at a temperature of 80 to 100°. The PbO_2 may be revivified by submitting it to the action of anodic O in an electrolytic cell.

Purification of Zinc Solutions.
Henry L. Sulman and Samuel Field, 209545, March 15, 1921. Zinc sulphate solutions are purified from Ni, Cu and Cd by treating the solution with Zn in a form which affords a large contact surface, such as Zn fume, at a temperature of 80 to 100°. A small amount of acid may be present and the Zn may be revivified by washing with dilute H_2SO_4.

Roasting of Zinc Ores Preparatory to Leaching.
Herbert Wm. Gepp, 209091, March 1, 1921. Zinc sulphide ores are rapidly roasted at a relatively high temperature until the sulphide S content is reduced to 6-10%, then slowly roasted at a lower temperature in the presence of an excess of air until the insoluble Zn compounds are converted into soluble Zn compounds. An oxide of Fe may be added to promote the conversion of SO_2 to SO_3 for the formation of $ZnSO_4$.

Process of Treating Mixed Sulphide Ores.
E. Langguth, 209092, March 1, 1921.

Manufacture of Aluminium Silicates.
R. Gans, 208968, March 1, 1921.

Process of Freeing Metals from Copper.
M. O. Sem, 209964, March 29, 1921. Iron containing Cu and Si are heated to 1450° with an Fe sulphide which reacts with the metallic Cu present forming Cu sulphide and metallic Fe which is then separated.

Softening of Water.
Robert Gans, 210230, April 5, 1921. Reissue of No. 135092, Aug. 2, 1911. Water is softened by passing it through zeolites, the latter being regenerated by passing through a solution of NaCl.

Treatment of Zinc Solutions Preparatory to the Recovery of Zinc by Electro-Deposition.
H. W. Gepp, 210192, April 5, 1921. Co is separated from Zn solutions for electro deposition of the Zn by precipitation with PbO in the presence of a Mn compd.

Disintegrating Metal.
Everett J. Hall, 208982, March 1, 1921. The process comprises striking a stream of molten metal on all sides and on convergent angles with a rotating annular flow of disintegrating gas and varying the angles in accordance with the suction desired. The molten metal is lifted from the supply and discharged through the nozzle.

Metal Disintegrating Apparatus.
Everett J. Hall, 208983, March 1, 1921.

Nozzles.
Everett J. Hall, 208984, March 1, 1921. A nozzle for disintegrating metal.

Fluxes or Solvents for Use in Technical Processes.
Albert A. Kelly, 209228, March 8, 1921. Sodium pentaborate is substituted for borax or boric acid in fluxes or solvents used in various processes.

Process of Extracting Cu from Its Ores.
Louis D. Mills, 209354, March 8, 1921. Finely divided metallized Fe ore is is added to an ore pulp containing Cu in solution and the precipitated metallic Cu is separated from the gangue by flotation concentration.

Dry Cells.
Carl Hambuechen, 211020, April 26, 1921. In dry cells the negative element is left unwrapped and is provided with protecting caps fitted over each end to prevent disengagement of particles and to space the element from the container electrode.

Flotation Agents.
Jos. H. James, 210808, April 19, 1921. The partial oxidation products of mineral oils such as petroleum containing naphthenes or alddhyde fatty acids are used for forming froth in concentrating ores.

The Process of Regulating the Quality of Coke.
Walter L. Graul, 210781, April 19, 1921. The quality of coke is regulated by adding to the coal to be coked such proportion of dry pitch or coke breeze as will correct the excess or deficiency of the coking substance in the coal and such additional amount of pitch and breeze as will give to the coke the desired toughness and hardness and then coking the mixture.

Alloys.
Foster Milliken, 210800, April 19, 1921. An alloy resistant to weak acids contains Cu 42-52%, Ni 22-28, Pb 22-30.

Process of Extracting Zn from Ores.
Frederick Laist, 210185, April 5, 1921.

Process for the Extraction of Zinc.
Fred. E. Lee, 210189, April 5, 1921. Zn is extracted from ores, concentrates, etc., by oxidizing the Zn content, dissolving the soluble Zn in dilute H_2SO_4, heating the residue in a sulphating atmosphere to convert the Zn into soluble compounds and then extracting the Zn. The Zn is removed from the solution by electrolysis.

Process for the Extraction of Lead from Sulphide Ores.
Wm. H. Hannay, 210188, April 5, 1921. Pb is extracted from its sulphide ores by grinding the ores in a neutral brine, leaching with ferric chloride to dissolve the Pbs and electrolyzing the solution to deposit the Pb and regenerate the ferric chloride.

Process of Extracting Metals.
Ernest Moulton, 210117, April 5, 1921. The terminals of an electric circuit are immersed respectively in an acid solution and in an alkaline solution of the metal. The method is particularly applicable to the treatment of low grade Zn ores.

Composition for Use in Case Hardening of Metals.
Porter W. Shimer, 210,372, Apr. 13, 1921. CaCN is prepared for use with a bath of fused salts in case hardening by mixing the CaCn with pitch or tar and coking the mixture.

Obtaining Gold and Silver from Solutions of the Double Alkali Cyanides of These Metals.
Horace Freeman, 210070, April 5, 1921. Au and Ag are extracted from cyanide solutions by treating the solutions with metallic Na alloyed or mixed with metallic Pb.

Process of Treating Crude Alkaline Earth Cyanide Compounds Containing Calcium Chloride.
Matthew F. Fairlie and Jas. J. Denny, 210502, April 19, 1921. Crude calcium cyanide containing CaCl is treated with Na_2CO_3 to precipitate the Ca as $CaCO_3$ and leave inert NaCl in solution. The tendency for such cyanide solutions to dissolve precious metals is thus removed.

Manufacture of Wrought Iron.
Jas. Aston, 211012, April 26, 1921. Wrought Fe is produced by granulating the molten substantially slagless product of a steel making process, mixing the granulated product with a molten slag of proper puddling characteristics and forming under the surface of the bath a mass of mixed metal and slag. The mass is then squeezed or pressed and the slab or billet rolled into the desired product.

CATALOGUES RECEIVED.

Baker's Analyzed Chemicals with Typical Analysis.— Analyzed chemicals are commanding increased attention among both manufacturers and consumers, as are also methods of analysis. This is evidenced by the action of

the American Chemical Society in appointing a committee on methods of analysis and standardizing chemicals and chemical apparatus. On account of the increased interest this catalogue, published by the J. T. Baker Chemical Co., Phillipsburg, N.J., should prove a valuable reference book for chemists to have on hand. It shows at a glance the analysis of practically every chemical used in the laboratory as manufactured and sold by the Baker Company.

Chemical, Oil and Metal Markets

The quotations below represent manufactures' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

HEAVY CHEMICALS.

The heavy chemical market has shown little change from its recent listlessness. Declines are noticed in Alum, Borax, Boric Acid, Caustic Potash, Muriate of Potash, Prussiates of Potash and Soda, Sodium Bichromate and Potassium Bichromate.

Caustic Potash continues in a much demoralized state, and offers of imported material of German origin are as low as nine and ten cents per pound. With the market in its present state, buyers are unwilling to risk heavy purchases. The only noted advances during the past few weeks are Coumarin 50c, Citric Acid 2c, and Naphthalene Flakes 2c; the advance being due to the increased demand.

There are much brighter prospects in the rubber trade, but buying is still rather spotty, owing to the heavy surplus stocks which the large companies still hold, and until same has been consumed, much business will not be possible.

The textile trade is still very jumpy, one week being rather brisk, and quiet again the following week.

FINE CHEMICALS.

The fine chemical market is still dull, and competition for the small business available unusually keen, with the result that distress goods are holding the edge by cutting in under manufacturers' quotations. Some products are selling below the maker's cost of production, and prices on the whole continue downward.

Castor Oil is weak, also Glycerine, Aspirin and Acid Salicylic, while Santonin, Citric and Tartaic Acids, Cream of Tartar, Saccharin and Caffeine are more firm.

OILS.

As forecasted in these columns in our last issue, crude oil has advanced in price. Pennsylvania crude is quoted at $3.50 (Toronto) per gallon, an advance of 50 cents over last month. While Mid-Continent Crude is holding at $1.75 it is very probable that before a month is past it too will advance. It may take longer than a month, but it more likely will not. Engineers and other buyers who acted on the suggestion given in our report in March and bought crude supplies at the low quotations then mentioned, will not be sorry. Fuel oil is off a little, having declined 2 cents in the past three weeks, and is quoted at 25 cents per gallon. Just how long this price will hold is difficult to say, but further reductions, while not impossible, are improbable.

METALS.

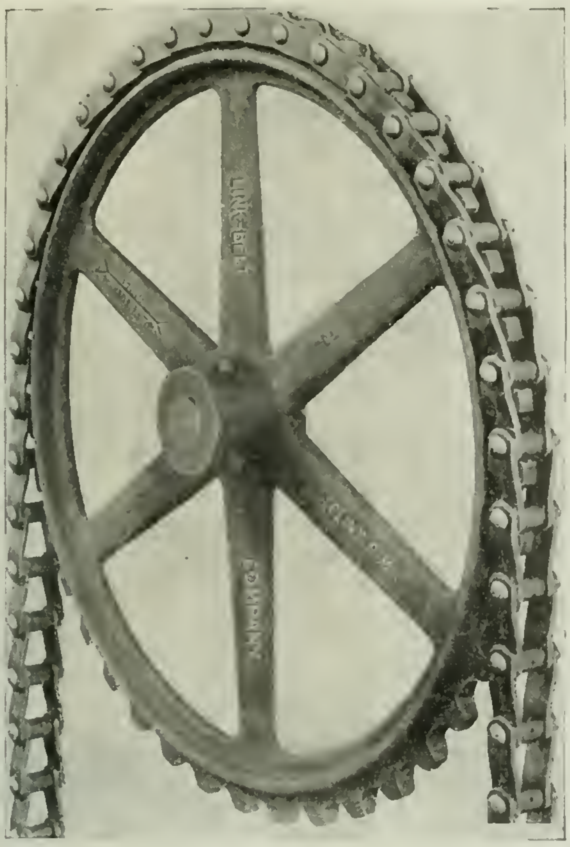
There is a little better demand for zinc and lead, with the result that prices on both show signs of stiffening. The copper market, however, remains dull, and quotations hover around $15.75 per cwt. for the electrolytic in car lots, Toronto and Montreal. The silver market, so far as Canada is concerned, looks brighter. During the month the price for Canadian silver in New York has advanced from 58½ cents per ounce to 60 cents. This is not much of an advance but in the very steadiness of the low prices it is believed the fact is revealed that not only has the bottom been reached, but that advances may be expected. The gloom which has prevailed over the Canadian silver mining industry during the winter and spring has been due to the large supply of the metal in world markets and the poor demand. But the supply will sooner or later become exhausted. When the large copper companies in the United States closed down this year they cut off a yearly production of 15,000,000 ounces of silver. At Cobalt the present rate of production is only 5,000,000 ounces per year, less than half last year's total. It would seem at this writing that this year this continent will produce little more than half last year's output. So that it is only within reason to expect that as trade generally improves, Canadian silver will stand a fairly good show in the decreased world market supply.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals.

Inorganic.

Alum. Ammonia, lump and ground	100 Lbs.	5.00— 5.50
Ammonium Bromide	Lb.	.. —.45½
Aluminium Sulphate, high grade, bags	100 Lbs.	.. — 4.00
Ammonia, Aqua 26	Lb.	.11— .12
Ammonium Carbonate	Lb.	.16— .20
Ammonium Chloride	Lb.	.15— .20
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .14
Barium Sulphate (Barytes)	Per Ton	30.00—35.00
Barium Chloride	Lb.	.05—.07½
Barium Nitrate	Lb.	.. — .20
Barium Sulphate, B.P.	Per Ton	100.00—110.00
Battery Acid, up to and including 1.400 sp. gr.	Cwt.	3.00— 3.50
Battery Acid, over 1.400, up to and including 1.835 sp. gr.	Cwt.	3.50— 4.00
Bleaching Powder, 35% drums	100 Lbs.	.05—.05½
Borax, crystals	Lb.	.. — .09
Boric Acid, powdered	Lb.	.. — .18
Calcium Carbide, car lots, f.o.b. works	Ton	.. —100.00
Calcium Carbide, ton lots, f.o.b. works	Ton	.. —105.00
Calcium Carbide, less than ton lots, f.o.b. works	Ton	.. —110.00
Caustic Soda, ground, drum	Cwt.	6.00— 6.35
Caustic Soda, solid, drum	Cwt.	5.00— 5.50
Calcium Chloride, fused	Per Ton	58.00—60.00
Camphor Monobromate	Lb.	.. — 3.00
Carbon Bisulphide, in drums	100 Lb.	.. — .10
Carbon tetrachloride, drums	Lb.	.18— .20
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	30.00—40.00
Cobalt Oxide, black	Lb.	.. — 3.30
Cobalt Oxide, grey	Lb.	.. — 3.60
Copperas (Iron Sulphate) crystals	Lb.	.. —.02¼
Copperas (Iron Sulphate) sugar	Lb.	.. — 02¼
Copper Sulphate (Blue Vitriol)	Lb.	.08—.08½
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 1.45
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fuller's Earth, car lots, f.o.b. Toronto	Ton	35.00—40.00
Ferric Chloride, crystals	Lb.	.13—.14½
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid, 60%	Lb.	.. — .30
Hydrofluoric Acid, 30%	Lb.	.. — .14
Hydrochloric Acid, carboys, 18	100 Lbs.	2.75— 3.00
Hydrogen Peroxide	Gal.	.. — 1.05
Iodine, crude	Lb.	.. — 4.76
Iodine, resublimed	Lb.	.. — 5.20



Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lithopone	Lb.	.09½—.10½
Magnesite, calcined	Per Ton	.. —25.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.18— .20
Magnesium Sulphate	Lb.	.03½—.04½
Mag. Sulphate, B.P., Medicinal...Single	Ton	70.00—75.00
Mag. Sulphate, Technical, car lots	Ton	55.00—60.00
Muriatic Acid, 18	100 Lb.	2.75— 3.00
Nitric Acid, 36 carboys	100 Lb.	.09—.09¼
Phosphoric Acid, 85%	Lb.	.43— .50
Phosphoric Acid, 50%	Lb.	.29— .31
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. — .4[illegible]
Potassium, Bromide, granular	Lb.	.. — .40
Potassium Bichromate	Lb.	.. — .35
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — ..
Potassium Chlorate	Lb.	.. — .18
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots		.. —.14¼
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots		.30— .35
Potassium Hydroxide (Caustic Potash)	Sticks	.. — .80
Potassium Iodide	Lb.	3.85— 3.95
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.65— .70
" Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Silver Nitrate	Lb.	.. —10.00
Soda Ash, bags	Lb.	.03—.03¼
Sodium Acetate, ton lots or over	Lb.	.. —.08¼
Sodium Acetate, lesser amounts	Lb.	.. — .15
Sodium Benzoate	Lb.	.80— .85
Sodium Bicarbonate, 100% pure	100 Lb.	3.85— 4.00
Sodium, Bichromate, bbls.	Lb.	.12— .14
Sodium Bisulphite, powder	Lb.	.. —.09½
Sodium Bisulphite, 35	Lb.	.05½— .06
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.. — .28
Sodium Hyposulphite, kegs	100 Lb.	5.00— 5.75
Sodium Nitrate, refined	100 Lbs.	7.00— 8.00
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	.. — 2.25
	Per Cwt. in Car Lots	.. — 2.00
Sodium Sulphite	Lb.	.. — .07
Sodium Prussiate, Yellow	Lb.	.16— .20
Sulphur, ground	100 Lb.	2.75— 3.00
Sulphur, roll	100 Lb.	4.50— 4.75
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.50— 3.00
Sulphuric Acid, 66 Be, tank cars		.. —24.00
Talc, No. 1 grade	Ton	.. —30.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	.. —18.00
Tin Chloride, crystals	Lb.	.40— .45
Tri-sodium Phosphate	Lb.	.. — .08
Ultramarine, Blue	Lb.	.20— .50
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting (English)	Ton	.. —40.00
Whiting (American)	Ton	.. —35.00
Whiting	Per Ton	35.00—40.00
Zinc Sulphate, com.	Lb.	.05¾—.06½
Zinc Dust	Lb.	.13—.14¼
Zinc Oxide, lead free	Lb.	.13— .15
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.. — .55
Acetic Acid, 28%, carload lots	Lb.	.. —.04½
Acetic Acid, 28%, 25 bbl. lots	Lb.	.. —.05¼
Acetic Acid, 28%, 15 bbl. lots	Lb.	.. —.05½
Acetic Acid, 28%, 10 bbl. lots	Lb.	.. —.05¾
Acetic Acid, 28%, 5 bbl. lots	Cwt.	.. — 5.85
Acetic Acid, 28%, 3 or 4 bbl. lots	Cwt.	.. — 5.90
Acetic Acid 28%, 1 or 2 bbl. lots	Lb.	.. — .06
Acetic Acid, 80%, carload lots	Lb.	.. — .12
Acetic Acid, 80%, 25 bbl. lots	Lb.	.. — .14
Acetic Acid, 80%, 15 bbl. lots	Lb.	.. — .15
Acetic Acid, 80%, 10 bbl. lots	Lb.	.. —.15½
Acetic Acid, 80%, 5 bbl. lots	Lb.	.. — .16
Acetic Acid, 80%, 3 or 4 bbl. lots	Lb.	.. —.16½
Acetic Acid, 80%, 1 or 2 bbl. lots	Lb.	.. — .17
Acetone, pure, drums or over	Lb.	.. —.19½
Acetone, pure, lesser amounts	Lb.	.. — .25
Aspirin, in 100-lb. lots	Lb.	.90— 1.05
Alcohol, Absolute Ethyl, case of 1 doz 1-lb. bottle	1-lb. bottle	.. — 2.15
Alcohol, Absolute Ethyl, in steel drums of 10 gallons capacity	Imp. Gal.	.. —15.00
Alcohol, acetone, bbls. or over	Gal.	.. — 1.40
Alcohol, acetone, lesser amounts	Gal	.. — 1.70
Alcohol, pure, bbl., 65% O.P.	Gal.	.. —10.50
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 1.15
Alcohol, wood, 95%, half bbl lots	Gal.	.. — 1.25
Alcohol, wood, 95%, lesser amounts	Gal	.. — 1.30
Alcohol, wood, 97%, bbls	Gal.	.. — 1.78
Alcohol, wood, 97%, half bbl. lots	Gal	.. — 1.90
Alcohol, wood, 97%, lesser amounts	Gal	.. — 2.65
Amyl acetate, technical	Gal.	4.75— 5.25
Amyl acetate, pure	Gal.	5.75— 6.25
Benzaldehyde	Lb	1.35— 1.60
Benzoic Acid	Lb	.. — .90
Caffeine, English	Lb	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 1.40
Carbolic Acid, white crystals	Lb.	.. — .20
Chloroform	Lb.	.57— .75

Citric Acid, domestic, crystals	Lb.	.. — .70
Coumarin	Lb.	.. — 6.00
Cream Tartar, 98%	Lb.	.38— .40
Dextrine	Lb.	.. —.08½
Ether, Sulphuric	Lb.	.35— .50
Formaldehyde, bbls. or over	Lb.	.. — .25
Formaldehyde, 200-lb. kegs	Lb.	.. — .28
Formaldehyde, 100-lb. kegs	Lb.	.. — .29
Formaldehyde, 50-lb. kegs	Lb.	.. — .30
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Gallic Acid	Lb.	1.26— 1.75
Glycerine, C.P., single tin of 56 lbs.	Lb.	.. — .31
Glycerine, C.P., two or more tins	Lb.	.. — .29
Glycerine (pale straw) single tin 56 lbs.	Lb.	.. — .30
Glycerine (pale straw) two or more tins	Lb.	.. — .28
Hexamethylenetetramine		1.10— 1.50
Oxalic Acid	Lb.	.25— .30
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.50
Phenolphthalein	Lb.	.. — 1.80
Pyrogallic Acid	Lb.	3.00— 3.50
Quinine	Oz.	1.00— 1.10
Saccharin	Lb.	4.50— 5.00
Salicylic Acid	Lb	.40— .45
Stearic Acid, Double Pressed	Lb.	.23— .27
Stearic Acid, Triple Pressed	Lb.	.26— .30
Tartaric Acid, crystals or powdered	Lb	.40— .45
Tannic Acid, commercial	Lb.	.. — .50

Rubber.

The following quotations on rubber are in American funds, New York delivery:

Crude.

Para, upriver	Lb.	.. —.17¼
Caucho Ball, upriver	Lb.	.. — .12

Plantation Rubber.

1st Latex Crepe	Lb.	.. —.18½
Smoked Sheet	Lb.	.. —.16½

Scrap Rubber.

Boots and shoes	Lb.	.04— .05
Automobile tires	Lb.	.. — .01
Steam and fire hose	Lb.	.. —.01½
Inner tubes, No. 1	Lb.	.. — .08
Inner tubes, No. 2	Lb.	.. —.05¾

Tanning and Dyeing Materials

Fustic Crystals	Lb.	.30— .35
Hematine Crystals	Lb.	.25— .28
Logwood Crystals	Lb.	.34— .36
Quercitron Liquid Extract	Lb.	.09— .10
Liquid Sumac Extract	Lb.	.07— .08
Ground Sumac	Ton	75.00—85.00
Chestnut Liquid Extract	Lb.	.3½— .04
Hemlock Liquid Extract	Lb.	.06— .07
Quebracho Liquid Extract	Lb.	.5½— .06
Quebracho Solid Extract	Lb.	.07—.07½
Liquid Blended Extract (Canadian)	Lb.	.4¾—.05¼

Metals.

Aluminium, No. 1, 98-99%	Lb.	.. — .29
Antimony	Lb.	.. —.08½
Brass, yellow ingots	Lb.	.. — .16
Brass, red	Lb.	.. — .18
Cobalt, metal	Lb.	.. — 4.50
Copper, electrolytic, small lots	Cwt.	.. —16.25
Copper, electrolytic, car lots	Cwt	.. —15.75
Copper, casting, small lots	Cwt.	.. —15.25
Copper, casting, car lots	Cwt.	.. —14.75
Gold, Pure	Oz.	23.00—25.00
Iron, Pig	Ton	.. —43.00
Lead, pig, small lots	Cwt.	.. — 6.15
Lead, pig, car lots	Cwt.	.. — 5.65
Magnesium, ribbon	Lb.	.. —18.00
Magnesium, powder	Lb.	3.00— 3.50
Mercury	Lb.	.. — 2.50
Nickel, shot or ingot	Lb.	.. — .40
Platinum, pure	Oz.	85.00—90.00
Silver, bar, American silver	Oz.	.. —.99¼
Silver, bar, Canadian produced, U.S. funds	Oz.	.. —.60¾
Steel, mild, ¼ inch, base price	Cwt.	.. — 5.75
Steel, mild, 3/16 inch, base price	Cwt.	.. — 6.25
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	8.15— 8.50
Tin	Lb.	.. — .36
Zinc, sheets	Lb.	.. — .25
Zinc (spelter) small lots	Cwt.	.. — 7.20
Zinc (spelter) car lots	Cwt.	.. — 6.70

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .38
Motor Gasoline (service stations)	Gal.	.. — .42
Lighting Gasoline	Gal.	.. — .47
Naphtha	Gal.	.. — .37
Coal Oil	Gal.	.. — .25
Fuel Oil	Gal.	.. —.08¼
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 1.75
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 3.50
Crude Creosote Oil, bbls.	Gal.	.. — .40
Refined Creosote Oil, bbls.	Gal.	.. — .55
Crude Coal Tar	Bbl.	.. — 9.20
Refined Coal Tar	Bbl.	.. —10.50
Coal Tar Pitch, bbls.	Cwt.	.. — 1.90
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52— .57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .10
Naphthalin Balls	Lb.	.. — .1[illegible]
Alpha-Naphthylamin	Lb.	.. — .51

Flotation Oils and Naval Stores.

Spirits of Turpentine, in bbl. lots..(Imp.)	Gal.	.. — .90
Rosin, Grade G, in 280 bbl. lots		.. —10.00
Rosin, Grade W.W., in 280 bbl. lots		.. —10.50

Gums and Vegetable Oils.

Vegetable Oils—

Anise Oil	Lb.	2.10— 2.25
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .21
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .19
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.30— .32
Linseed Oil, raw, in bbl. lots ....(Imp.)	Gal.	.. — .85
Linseed Oil, boiled, in bbl. lots ...(Imp.)	Gal.	.. — .88
Monopole Oil	Lb.	.. — .30

Gums—

Indian, No. 1A	Lb.	.. — .40
Indian, No. 1	Lb.	.. — .38
Tragacanth, No. 1, Ribbon	Lb.	.. — 4.50
Tragacanth, No. 1, Flake	Lb.	.. — 3.50
Tragacanth, Turkey	Lb.	.. — 3.75
Arabic, clear amber sorts	Lb.	.. — .18
Arabic, regular grain No. 4 and No. 6	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22½
Arabic, white sorts	Lb.	.. — .40
Arabic, powdered, No. 1	Lb.	.. — .25
Arabic, powdered, No. 2	Lb.	.. — .24

Fertilizer Materials

Animal Tankage, per unit of Ammonia		7.00— 7.50
Animal Tankage, per unit of Bone Phosphate of lime		.. — .10
Nitrate of Soda	Ton	100.00—105.00
Muriate of Potash	Cwt.	7.00— 7.50
Pure Ground Blood, per unit of Ammonia		6.50— 7.00
Steamed Bone Meal	Per Ton	65.00—70.00

C. P. Chemicals.

Ammonia, C.P.	Lb.	.. — .26
Hydrochloric Acid, C.P.	Lb.	.. — .15
Nitric Acid, C.P.	Lb.	.. — .23
Sulphuric Acid, C.P.	Lb.	.. — .14

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P. F. McCLEARY, Associate Editor. T. LINSEY CROSSLEY, Editor. L. E. WESTMAN, Business Manager.

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EDITORIALS

ESTABLISHING THE RESEARCH INSTITUTE.

THE Government is to be recommended on the way the Bill relating to the Establishment of a Research Institute has been carried through. The members are no longer quite so afraid of the idea and are accepting the move on the assumption that it is being put forward in a plain, above board manner for the general interests of all our industries, and not because any class in particular has something to get out of it.

The debates on the Bill indicate that few members were able to speak on the subject along broad lines based on any concrete or detailed conception of just what the function of the Institute would be. This was indicated by the everlasting reference to the production of peat fuel and a lack of ability to distinguish between this and other departmental laboratories. Important as peat may be, this question has been discussed in season and out until it has become about the only thing that the Mines Branch stands for in the eyes of some members and a large section of the public. Agricultural interests, manufacturers, chemists, engineers, university teachers, and research workers have more in mind than the utilization of one particular resource. It is their idea that this organization will be a key link in a chain which will correlate and direct the industrial development of the nation. It will not be done in a day, but it is along the right line.

The outstanding thing which should impress business men and holders of capital most, and which actually has the least effect, is that most recent industrial progress has been made possible by the application of science to industry. You may use the old method efficiently without making progress. Research is a combination of all scientific forces directed by some organization searching the new and tuning up the old.

If we were content to let good enough alone we could rest on our oars, but unfortunately our neighbor will not do this also and so we get behind. It has been this research applied in a large way which has allowed the Western nations to dominate those of the East whose activities have been in late centuries confined to mental research.

Governments in democractic countries will have the greatest difficulties presented when handling industrial research organizations, because they tend naturally to the autocratic method of administration and the nationalization of certain activities. A really efficient organization of this kind must be put more on a war industrial basis than on anything else. The idea of giving scientists power and money with which to officially command capital and industries must come slowly. This connection between industrial research in England, Canada, and to a lesser extent in the United States, and war time necessities is still with us, but it is doubtful if any Government will have foresight enough to carry on industrial developments along war like principles.

Undoubtedly if manufacturers in all lines would combine through the Government with such scientific talent as is available for the production of more capable research workers and the general elevation of the technical plane upon which they are working, a measure of efficiency would result exceeding all expectation. The power of German chemical industry is made possible because it consists practically of two large combines.

This inability to co-ordinate will not be overcome easily.

The Government will probably not undertake things on the assumption that there is an industrial war necessity. They will not supply funds. A staff will be created only to be thwarted and bound about with difficult organization machinery. The sacred rights of individual capital and property will make it most difficult for government employees to carry through to a commercial basis any ideas they may develop unless they be in a field so barren that no one else would dare undertake to make progress possible.

If by any strange possibility, a democratic government should in a measure realize that in this game big chances must be taken, win or lose, that there can be no compromise with scientific laws and nature, nor can a vote be taken, and that it is not beyond reason to have in all industries a few government plants actually run by people whose business it is to operate on a dividend basis, using best and latest machinery, devices and principles, then we believe a new era would dawn. If the factory stage could be undertaken in more lines along with the development work necessary, it would be an advance. In short, let the Government translate its own reports into going factors in trade to an extent sufficient to demonstrate the business value of the results of the research. While the plan suggested might be a little too paternal, there is no doubt but that a government research institute or a series of them

would in a short time repay the millions which could be invested properly in this way.

Our industrial outlook is most black and without parallel from the view point of debt, and we suggest solutions equally drastic but reasonably certain.

CANADA AS A FACTOR IN THE WORLD'S CHEMICAL INDUSTRY.

WITH a population of eight million on an area of approximately three million square miles, it might be supposed that for many years to come Canada would be chiefly an exporter of foods and raw materials.

From another view point an entirely different idea of the future of Canadian industry is apparent. The dominating factors in the chemical industry of the future will be nitrogen fixation, cheap power, cheap fuel, and a source of raw materials for synthetic chemistry.

In those days, it may be a cause for gratitude to Providence that our coal has not been devitalized into anthracite. It will certainly be a reason for thankfulness that our statesmen are making their best endeavor to protect our forests, and maintain the reservoirs of our liquid electricity by preserving a carpet growth on the Northern hills.

When the righteous shine as the sun, among the shiniest names will be that of Henri Joli de Lotbiniere, who did great things for Canada, by way of trees, and trees spell power.

Power, fuel, and transport will decide chemical and metallurgical leadership, and of these Canada has nearly 2,500,000 horse-power developed from water, with a rough estimate of 19,500,000 horse-power available. Of coal, one Province alone, Alberta, is estimated to contain fifteen per cent. of the world's supply*, while as to transportation, it is generally conceded that our three transcontinental lines are built on a basis of the requirements of twenty-five years hence, while our internal navigable waters already of exceptionally large mileage, will before long be greatly increased in carrying power. These primary factors are supplemented by oil areas of unknown but assuredly great importance, with forest and field crops of huge aggregate value, and capable of producing fats, oils, starches, sugars, cellulose, and albumins in almost unlimited quantities.

In 1893, the writer stood facing Shawinigan Falls. The nearest rail was the Piles Branch of the C.P.R.; twelve miles away. There was a small bungalow-like hotel used by occasional tourists, and above the Falls one whitewashed house, where the Government's log inspectors lived. The sole development was a long chute to short circuit the logs round the Falls to escape the gorge.

There are now; an aluminum plant, which produced 26,000,000 pounds of aluminum in 1917, using 56,000 horse-power; a pulp and paper company, making 165 tons groundwood, 90 tons of sulphite pulp, and finishing 200 tons of newsprint paper daily; a carbide plant producing 200 tons of carbide daily, using 40,000 horse-power; several other electro-metallurgical plants, a commercial research laboratory, and a high-grade technical school. 1300 miles of transmission wires carry Shawinigan power, including 60,000 horsepower to Montreal, 100 miles away.

The Shawinigan Water and Power Company, received its Charter in 1898, so the whole of this immense development has taken place in less than twenty-five years, and Shawinigan is only a sample.

Who can predict the possibilities of the St. Maurice valley with similar development possible at several points, such as Grande Mere, Grand Piles, and La Tuque. When the St. Lawrence Rapids, and the Niagara power are added with several other districts, such as the Saguenay, and the Northern rivers, it should be abundantly evident that much of Canada's future is bound up in things other than agrarian, though agriculture is essentially a chemical industry, and will develop into highly intensified lines, producing more material from more suitable lands, leaving greater areas available for the forest crops which will be grown under proper control, and maintain another group of wood distillation industries.

Don't get impatient if we have said things like this before. We've got something to crow about, and it's a poor rooster who only crows once. We have a land to be proud of as chemists, as well as, Canadians, so let us all sing "O Canada Mon Pays, Mes Amours et Mes Laboratoires."

*W. J. McAllister, before the Parliamentary Committee on Fuel Supply.

UNWINDING.

IF it were possible for all of us to cut wages and cost prices in Canada by one-half, as easily as we set the clock back an hour, we would be, provided this were not done in the United States, in a wonderful position to compete with American industries. Considerations like this help to explain present world conditions. Our national debt would be made exactly twice as difficult to pay off, if not made any larger as figures go, but we would probably find everyone busy, factories humming, and the total turnover and wages might exceed what we now obtain at double the price. In spite of the fact that our own

products do not sustain us entirely we would probably be much better off.

Everyone was a booster for inflation, so that process went on fine, but now nobody wants to come down. What is wrong with this country, and we in America generally, is simply this:—We are on a plane trying to compete with other people on a wage scale, so far below us relatively, that we simply cannot get going. If North America were entirely cut off from the rest of the world, everything would be different. Large units of people make loans to smaller units, and debts are created, which, if spread out, would not disturb so greatly, but, as it is, nearly upset our geographical boundaries entirely.

The artificiality of national life and the relations between units of people is most amazing, and confusing, from the economic viewpoint. Until we have universal free trade and a permanemt adjustment of population along economic lines, without regard to present national boundaries, it is essential that absurdities must exist and false stresses and strains created, in order to maintain developments, which should never have occurred, and were not intended by nature.

The theory is fine, but the unwinding process is very painful. When a man says he will not work for any less money, he makes a foolish statement, which, if persisted in, will eventually leave him working for nothing, or enslaved by some such system as overcame Russia. The recovery of Europe is slowly, but steadily, reducing us in America. As they wind up their industrial machine we must unwind ours. As the patient recovers, the crutches we built are no longer in demand, and we, who were well trained in making crutches, are out of a job, and reduced to primary considerations of existence. We in America might, of our own accord, if we had the intelligence, rectify the situation to some extent, by unwinding by Act of Parliament. It might not be fair but it would be efficient. The thinness of the air will kill us if we do not open up more new valves and let our lighter gas escape. Our paper prosperity, our gold reserve, is something to be forgotten about and discarded as false security.

This is the path we are on, and if wage-earners do for a little while hold up manufacturers, and their employers, it is not likely that they will recover more than they missed during the period of advance. Obviously, they cannot get beyond the reserve energy of the particular company. If it could only happen faster, without wrecking more machinery, we would get on with the job of paying off the interest, which will be the net residue of all our recent excessive prices and waste, so often misnamed prosperity.

AMBROSE MONEL.

WE greatly regret to record the death of Ambrose Monel. If a great many things were known that, perhaps, may never be known, except to a privileged few, it might well be that the metallurgical industry of Canada would not be the only interest that would enshrine Monel.

At forty-seven, Monel burned out. He did not burn his candle at both ends, but he burned one end with the brilliance of many candles. He himself had said at one time it was no use to live seventy years if you could put it into fifty, and that's what he did.

A graduate of Columbia University, he entered the Carnegie Steel Co., reaching the position of metallurgical engineer. In that capacity, he was sent abroad, and shortly after his return, the Monel open hearth process of making steel was developed. In 1902, at the age of twenty-nine, he became the first President of the International Nickel Co.

At that time New Caledonia was supplying 70% of the world's nickel. Now Canada supplies 80% of the greatly increased world's market, and Monel is largely responsible for that. One of the metallurgical difficuties of the Canadian nickel development has been the separation of the copper and nickel. Monel said "Why separate," so we don't, and "Monel" metal now supplies much of the broadened field.

Monel spent in the Canadian woods most of the time he gave to sport.

In a measure, perhaps more than we know, he was a victim of the war. When the United States entered the conflict, he resigned his presidency, and became a colonel in the aviation corps. The increased demand upon an intense nervous system, never spared, probably contributed in a large measure to his early death.

By a singular coincidence E. C. Converse, chairman of the Board of the International Nickel Co., and one of the original three owners of the Company died exactly one month before Monel. The Company has thus lost in Capt. Delamar, Mr. Wood, Mr. Converse, and Mr. Monel, four of its leading executives in less than a year and a half.

CHEMICAL EXHIBITS AT NATIONAL EXHIBITION.

IT will be remembered that an important movement along this line was started last year. A space for exhibits was secured in the Process Building of the Exhibition. Some twelve companies took part in this, the first effort of the kind ever attempted in Canada.

It is sufficient to state that the whole idea was a success and a distinct addition to the exhibition.

Unfortunately, we understand that no space for expansion exists this year. Already there are more applicants for booths than can be accommodated and until some extension of buildings is completed, nothing can be done. The magnitude of this Annual Exhibition is the wonder of all visitors. Its business and industrial possibilities are only appreciated in part even yet.

The program of the Exhibition directors is most comprehensive. In fifteen years it is unlikely that much will be left of the present buildings, and the design of the grounds will be altered to meet requirements. Under the new plan something will be created as much in advance of the facilities now existing as the present is beyond the dreams of the original founders.

Our chemical and metallurgical industries are wise in using this great annual gathering for educational and business purposes. Machinery typical of that manufactured in Canada has been shown for a long time but specialized machinery and processes have not been demonstrated to the same extent. For the future a better classification should be planned. Instead of many smaller scattered sections, the whole group of mechanical and engineering devices along with basic commodities should be combined in a general industrial engineering building where process machinery of all kinds could be set up and operated and where such branches as chemistry and metallurgy would have a natural field of expansion. If this were done, the benefits derived from similar exhibits in the United States and Europe would be available here, and a new reason established why the whole body of chemists, engineers, manufacturers and their technical employees should visit the Exhibition. This might mean that more foreign made machinery would be shown but as it is used in our industries and not made here no injury should result to Canadian business.

For the rapid introduction of a new process, machines, types or materials used in manufacture, nothing better could be devised than an annual industrial engineering exhibit with the word "Progress" permanently over the doors.

PREPARED POSITIONS IN THE REAR.

WHEN Hindenburg and Company were defeated and virtually running away, they issued statements that they were moving to "prepared positions in the rear," Meantime their progress was being considerably accelerated by the allies moving to unprepared positions in the front.

We are prone to hanker for prewar conditions and to try getting back to "normalcy."

Just as a successful advance meant arrival in unfamiliar surroundings which had to be consolidated, so we must realize that in many ways we must consolidate a new norm.

We should certainly attain a new point in the matter of mutual service for community and national welfare. There has been progress, and probably more progress than appears on the surface, in improving the relations between employer and employed.

Practical transportation of passengers and mail by air has been developed. Our machine shops are able to handle with speed and accuracy work, which would have been considered out of the question six years ago.

The development of the electric furnace has made metallurgical work possible today, that a few years ago would have been impracticable.

We have made strides in star gazing, and structure of molecules. Why go back to prewar conditions?

FUTURE FUEL SUPPLY.

THE "Official Report of Evidence" taken by the Parliamentary Committee, appointed to inquire into matters pertaining to the future fuel supply of Canada is most interesting.

This Report is too voluminous to discuss critically before going to press.

We shall read it with hope, but not too great hope, recalling the tariff and other commissions, that it will lead to a more scientific handling of Canada's remarkable coal fields.

DISCOVERIES.

IN two successive days we noted reports that a French scientist and a Canadian engineer had independently solved the question of making steel direct from iron ore, and that a new form of ether had been discovered which suspended one's judgment and made him tell the truth.

Now Hatfield, the rainmaker, has an inch of rain to his credit in the West, and Sir Henry Drayton has brought down his budget.

We are getting along, brothers.

FINANCIAL.

WE were talking at the C.I.C. meeting the other day about chemists' remuneration. It is our personal opinion that what chemists have doled out to them is just muneration. What lawyers, bankers, and plumbers get is *re*muneration.

ANNUAL MEETING S. C. I.

Are all Canadian chemists planning now for this epoch-making meeting ?

The Chemical Engineer and the News-Mill Division of the News-Print Industry*

A Practical Discussion of Specific Problems Solved by the Application of More Efficient Methods.

By R. W. McKENZIE

The early method of mixing the groundwood and the sulphite was in the beater. The laps of groundwood and sulphite were weighed and the desired proportions were put in the beater each time. With the mixing tank, the slush stock is pumped direct from the storage tanks to the mixers. The mixing tank would be filled to a predetermined level with groundwood and then the sulphite would be pumped in until the tank was full. Agitators in the mixing tanks would mix the stock. The level for the groundwood stock in the mixer was determined for a fixed consistency of groundwood and of sulphite. The chemical department found by taking consistencies of the groundwood and sulphite entering the mixers that neither the groundwood nor the sulphite were averaging the fixed consistencies. It was also found that if the paper-maker was having trouble keeping his machine running, he would have the mixer foreman increase the amount of sulphite in the mixer until the machines were righted again. The result was that instead of the news-print containing 20% sulphite, as the paper makers contended, it actually had an average of 30%. In order that the consistencies of the two stocks would be regulated, and made to conform to set standards, regulators were installed on the lines running to the mixer. A recording gauge was installed on the mixing tank so that the level of the groundwood put in and the number of mixes per day would be known accurately. Sampling of both the groundwood and sulphite entering the mixers was made routine as a check against the regulators. This latter was found necessary as the stock runners in the sulphite screen room would, when they got behind with their washing and screening, run the stock so thick through the system that it was impossible for the regulators to bring down the consistency to the required percentage. When the system was properly working the levels in the mixer were adjusted so that they were actually using an average of 20% of sulphite in the paper. Any variation from this was shown on the records and in this way the sulphite was not used so freely. By using 10% more sulphite than was necessary, it is quite evident that it was a large loss to the company. Sulphite stock, suitable for making news, is normally worth $50 per ton more than groundwood, and in a mill making 200 tons of news per day, that is, using 10% more sulphite than necessary, it is readily seen that the loss amounts to $1,000 per day.

Handling the Stock.

From the mixers the stock goes to jordan chests. It is run through jordan machines and then to the machine chests. When pumped from the machine chests the stock is thinned from a consistency of about 3% to 0.5% in which state it goes to the paper machine. The pumps taking it from the machine and jordan chests are centrifugal usually and the head in the chests controls partially the throw of the pumps. The operators were cautioned to keep the chests full at all times, but there was no record showing that the order was being carried out. If the operators were in trouble or sleepy on the night shifts and allowed the stock in the chests to get low, there would be trouble on the paper machines. At times the operators, when their chests ran low, would turn water into them so as to have full chests when going off their shift. The paper machines being fed out of these chests would refuse to make paper as the consistency was too low. Sometimes the fault would be laid on the sulphite mill or the groundwood mill, but after the operations had been put under technical control, there was no argument, and the cause of the trouble was traced back to the paper mill. As a check on the operators handling the stock, level gauge recorders were put on the chests and this trouble was eliminated as far as the carelessness of the men in the mixing room was concerned. The stock as it goes on the wire is very low in consistency, some of the water drains through the wire, some is taken out by suction boxes and some pressed out so that when the sheet reaches the steam driers, the consistency is about 33%. When it gets through the driers the sheet contains about 95% stock.

The average paper maker is a pessimist and many attachments for paper machines and improvements have been discarded because of that attitude. Instead of co-operating and giving the new idea a fair trial, they were making trouble for themselves. When, for example, they had trouble on the machines and the sheet continued to "break," instead of having recorders, etc., to help locate the cause, they were more likely to go to the steam plant and inform the engineer that he was not giving them enough steam to dry the sheet, or to the groundwood department and claim that the stock was too hot. The real trouble may have been that their press felts were gummed up and needed washing. This attitude is gradually being overcome and conditions are being bettered, and the paper maker actually begins to discuss his difficulties with the technical department as soon as he realizes that the engineer will help reduce the irregularities.

Moisture in Finished Paper.

The publisher wants a certain fixed average per cent. of moisture in his sheet and it was set at 8%. The result of a series of samples run through for moisture content in the laboratory showed that the average percentage was about 5%. This meant that the manufacturer was putting more stock by about 3% into his paper than he was getting paid for, and this was quite a loss where they were running 200 tons per day. In order that this would be corrected, drying ovens were installed in the paper mill and moisture tests run on every set. Everything was arranged so that these tests could be completed as quickly as possible and the results given to the back tenders. They could arrange

*Fourth and concluding article in the series by Mr McKenzie dealing with the pulp and paper industry and appearing in our March, April, May and June, 1921, issues.

their drying so that the moisture content would be more uniform and would run close to the standard percentage.

Quality.

Much the same was happening in the paper mill as had been taking place in the acid plant when the acid-makers were running the acid tests. The acid maker would be handling a wrench or changing a gas line and would then turn to take an accurate sample of acid in his pipette, dilute it, add the indicator and put in the neutralizing solution and he would naturally get results that varied as much as 30%. The paper maker would get much the same calibre of results in ascertaining his basis weights. The patterns used for holding the sheet while it was being sized were made of a light gauge of galvanized iron, and besides being bent at the corners, were not even square, being bigger at one end than at the other. This made it doubtful whether the samples would be too large or too small. The balances, being sensitive, have to be handled carefully, and the operator would be just as liable to slam the sample on to the scale pan as not and the result was that of the four balances in use in one mill, no two would give the same basis weight from one sample.

Regarding the "pop" test the operator was getting strength results that were not reliable as the proper care was not used in operating the instrument. For uniformity the paper maker would hold the sheet up to the light and decide in that way whether it was a good or bad run. No standard uniform sheet was used to compare with and the uniformity test was therefore very vague. Color of the sheet was decided in much the same manner as the uniformity, and the color was either good or bad. To overcome these "rule of thumb" methods the technical department was given control of these tests. Accurate patterns were made for making the samples. The balances were adjusted and trained men were put on this work. These men also handled the moisture tests. On the uniformity testing, standard sheets were kept and the degree of uniformity brought to a percentage basis. Regarding color a photometer was used and instead of having good, bad or indifferent degrees of color, everything was put on a percentage basis. When these tests were working it was then possible to make comparative charts for the benefit of the operators so that they could all see what the different machines and their tenders were producing. In this way a fair rating was given against quality and quantity production.

Finishing Room.

The rolls are weighed, wrapped, and any badly wound rolls are re-wound in this department. The method of moving these rolls was by hand truck and required quite a number of strong men to wrap the rolls, up-end them and wheel them into the cars. Much of this laborious work may be overcome by the use of electric trucks that are so designed that they up-end the roll and deliver it right into the cars. Indicator balances are gradually replacing the older form of arm scales. It was found that these scales for weighing the rolls were not being adjusted regularly with the result that the weights were not accurate. Test weights were provided and the testing and adjusting of all scales in the plant made routine. In the finishing room the men on the scales were acting as inspectors and were also testing for basis weight and strength. These results were about as variable as had been the back-tenders' in the paper mill. Their knowledge of possible errors in securing accurate results was poor. This, when taken along with the patterns they were using, meant that the reports going into the office did not give the quality and quantity of the mill production accurately. A better class of men were put on this work, and a close check was kept on them by the technical department so that the results obtained from the finishing room were dependable.

Present and Future Problems.

The mechanical or groundwood pulp, as at present made for news, has not a strong fibre. The groundwood fibre is also shorter than the sulphite fibre and the sulphite is used to give the strength to the sheet. There are some mills that are not using more than 15% sulphite pulp in their news, while the majority of the mills run much higher. Mills using the smaller percentage of sulphite are giving greater attention to the grinding process and are getting a fibre that will mat with less sulphite and still make a good sheet of news. How much it is possible to reduce the percentage of sulphite used in the manufacture of news print and whether it can be gradually eliminated is a problem that is up to the technical departments and the more the grinding process is brought under control, the closer will we be to a news that has good quality and a minimum of sulphite. There are still many variables possible on the paper machines which eventually will be brought under control by the use of recorders designed to indicate how each unit of trouble will be found and removed. Much of the hand control will be replaced by automatic control and this does not necessarily mean that the paper maker will suffer. He will become a more highly specialized workman as he learns more of the laws of the process. The paper maker will need more automatic equipment on the high speed and wide paper machine if it is to be kept running at its rated capacity. Many of the materials are being purchased for the paper mill on the grades set by the producer. Coal is still being bought on the "rule of thumb" grading of the mine operators, while in actual heat giving value it varies, as all engineers know. In the purchasing of the clothing for the paper machines and the raw materials used, physical and chemical tests are going to play a greater part than at present. With the bigger and faster running machines coming on the market, the replaceable equipment is due to receive more attention. The chemical engineer is placing more uniform stock in the hands of the operators and it is also essential that uniform wires, etc., be used. Action in this direction will start from the technical departments. In the finishing room, the wrapping, etc., of the paper rolls is being done by hand, whereas this labor can be replaced by machinery that would do away with the heavy work. As in the introducing of anything that is a drastic change from the regular routine, it is necessary that the technical man follow up the installation and early operation of the new method or it is likely that someone will throw a wrench into the works and the operator will come back and say that he knew it could not be done. Only half the problem is solved when a waste or variable operation is found by investigation of the technical department. The other half is in finding the solution, seeing that the necessary changes are made and being able to operate them if the workman cannot, this latter being for the purpose of showing the operator how the changed process should be handled. Recording apparatus needs maintenance just the same as any other machine, and in many cases this is neglected, with the result that the recorders are out of adjustment and the operator gets the idea that they are of no use. This

is the business of the technical department, as these instruments are delicate and need expert attention.

From the broadest viewpoint the pulp and paper industry is a large field for the chemist and chemical engineer. Its development has been enormous, but there are few mills where refinements might not be introduced which would be real money savers. Practical superintendents and mill workers are improving as they come in contact with advanced ideas and grasp the higher conception of efficiency. A still larger field for the chemist will open up if Canadian mills ever establish alcohol recovery systems or special paper products and by-products. The importance of this viewpoint and the general question of technical control should be one of the chief cares of the directors of the capital invested.

Manufacture of Ethyl Alcohol from Sulphite Liquor*

THE Ethyl Company is a large Swedish organization interested in the recovery of ethyl alcohol and evaporated residues from the sulphite liquors of pulp mills. Progress in this direction has been rapid in Sweden during recent years, where production of pulp in 1909 was 385,000 tons and in 1916, 771,000 tons. Since that time there has been some falling-off in production. The Ethyl Company was formed to operate the patents of Mr. Gosta Ekstrom and started operations in 1909.

While the production of fermentable sugars varies, it has been found largest in plants using boiling with direct steam; and where a bleached pulp is manufactured. Their process calls for a separation of the alcohol and the manufacture of a fuel from the residue. That portion of the sulphite lye of a concentration which can be used is neutralized with lime, and stirred by blowing air through it in a concentrating tower. After settling, the clear lye, now at 158° to 176° F., is pumped through a cooling tower to fermenting tanks, and is brought down to 86° F. Yeast is added and such yeast foods as ammonium sulphate and phosphoric acid. After fermentation, the liquor runs about 1% alcohol by volume. After passing through a series of tanks and following distillation, an alcohol of 95% strength is produced.

The first factory of the "Skutskar" sulphite works turned out 457 gallons of 50% alcohol per day. In 1911, with two other factories established, the output was nearly one and a half million gallons of 50% spirit per annum. In 1918, six more factories were started, and now there are 21 plants producing alcohol in this manner in Sweden. In Norway, four plants are operating, and some have been established in Finland and Germany. The total number of plants now operating amounts to forty-five.

Production Cost.

Based on 20,000 tons pulp per year and a liquor recovery of 1,455 gallons per ton pulp, to yield 1.1% per volume alcohol.

Production based on 264 gallons (1 cubic meter) of waste liquor treated.

Raw Materials:—

Steam—300 lbs. of 10 lbs. pressure requires 50 lbs. coal at $5.13 per ton	11.6c
Neutralizing agency—20 lbs. @ $5.00 per ton	5.0
Chemicals	2.3
	18.9c
Labor:—	
7 laborers and 2 superintendents running 70 tons per day, cost per 264 gallons, with wages, $45.50 per day	11.7c
Power, Light and Other Expenses	5.3
Total	35.9c

It is estimated the 264 gallons waste liquor produce 2.9 gallons 95% alcohol; so that cost of production per gallon of alcohol is 12.4c on above rating.

Considering operations producing 320,000 gallons of 95% alcohol per annum, it is estimated that plant would cost $180,000; so that, with depreciation at 10%, and interest at 6%, the amount charged for this factory would be 9c per gallon. The whole estimated cost would be **21.4c per gallon of 95 ethyl alcohol**, according to these calculations.

For the recovery of other waste products from the liquor, evaporation is recommended and the type in use in Sweden is the Thunholm Evaporator. In this evaporator the heat surfaces are flat, ring-shaped plates and tubes are avoided. It is claimed that in this type, with a difference in temperature of 6° C. between steam and solution 100 kg steam per square meter per hour were evaporated. The design of the evaporator is based upon: (1) The depth of liquid on heating surface; (2) The cleanliness of heating surface; (3) Heat conducting capacity of materials; (4) Absence of condensing water on opposite surface; (5) Speed of steam over surface.

It is estimated that a fuel running 6,500 kg. calories= 11,700 B.T.U's. can be produced at $5.13 per ton.

* An abstract of report by N. Clementson on Manufacture of Ethyl Alcohol from Sulphite Liquor, with special reference to equipment of The Ethyl Co. of Sweden. The report appeared in full in "Pulp and Paper Magazine of Canada," March 24, 1921.

THE AERATED WATER INDUSTRY IN CANADA.

According to a preliminary report of the Dominion Bureau of Statistics, covering the year 1919, the number of plants in the Aerated Water Industry in Canada are 320. The importance of this industry from a chemical standpoint is shown from the following items of materials used by the industry during 1919:

Classes of Materials	Unit of measure	Quantity.	Value.
Sugar	lb.	11,511,896	$1,349,234
Saccharin	lb.	4,174	27,766
Citric acid	lb.	38,409	44,201
Tartaric acid	lb.	34,348	29,306
Carbon dioxide gas (in cylinders)	lb.	1,491,470	125,777
Alcohol	proof gals.	5,006	42,166
Beer (any strength)	gals.	665,774	332,342
Cider (fermented or not)	gals.	198,035	51,668
Syrups and fruit juices	gals	56,220	86,798
Flavoring extracts and essential oils	gals.	18,322	142,277
Aniline dyes and other colors		......	20,279
Containers, labels, etc.		......	888,088
All other materials		......	245,681
Total cost of materials			$3,385,583

The total selling value of the products of the industry at the works was $7,366,759, and included such products as soda water and aerated water valued at $2,613,629; coca-cola valued at $1,569,837; other carbonated non-alcoholic beverages valued at $1,469,297; natural mineral waters, $290,484; cider, $247,926; temperance beer, $583,-972; and other products, such as syrups, fruit juices, vinegar, etc.

Report of British Mission Appointed to Visit Enemy Chemical Factories

Interesting Data Regarding Present Status of German Chemical Plants

ALONG with representatives of allied countries, a party of British chemists visited chemical plants in occupied German territory. Their preliminary report is interesting as an authentic account of what had been done by these plants and as a basis of present German capacity in these lines. Some eleven plants were visited. General information was obtained with regard to the methods of manufacture of explosives and poison gases and the initial products for their production. It was due more to the second large amalgamation of German chemical interests known as the I. G. (Interessen Gemeinschaft) combination, rather than the older Bayer, Badische A.G.F.A. Companies that Germany was able to produce synthetic ammonia and nitric acid—the basis of her ability to continue the war.

Explosives.

The factories within occupied districts can hardly be considered representative of the explosives industry of Germany. A small fraction of the total propellant explosives was made in these factories, but a larger amount of high explosive. The chief high explosive made was trinitrotoluene, but picric acid and dinitrobenzene were also made in quantity. Most of the nitro explosives were mixed with ammonium nitrate, in the proportion of 60-65 per cent. of the former to 40-35 per cent. of the latter. The chief differences between German and English methods of manufacture appear to have been those made necessary by the blockade. Plants were erected to produce nitric acid from ammonia instead of nitric acid retorts. Paper crepe was used for nitro cellulose and glycol in place of glycerine. The processes for making the nitro compounds differed only in detail from those of England. Nitro bodies were handled in the liquid condition and the method of pelleting by running the liquid nitro body into water, with agitation, almost universally employed in England for T.N.T. was found only in one case, viz.: the manufacture of dinitrobenzene and dinitrotoluene at Ludwigshafen. Nitrators and separating vessels were seldom provided with bottom exits, but were built to allow discharge by compressed air.

The general methods of nitration employed differed little from those in use before the war. Trinitrotoluene was invariably made by the three-stage method, fresh mixed acids being generally employed at each stage; extraction of the spent acids by means of the nitrobody next to be nitrated was carried out, but had not been developed to the extent that the detoluation operation was carried in England. The separation of metanitrotoluene from the mixed mono-isomers by fractional distillation in vacuo, carried out at Leverkusen and Hochst, allowed of the production of a relatively pure trinitrotoluene without later purification; neither the sulphite nor the alcohol purification was employed in any of the factories visited. Chlorbenzene was nitrated direct to dinitrochlorbenzene, and naphthalene direct to dinitronaphthalene. Tetryl was also obtained from dimethylaniline in one operation, as in England. Dinitrobenzene was obtained from benzene by nitration in two stages.

Economy in the use of acid did not in general appear to have received so much attention as in England. At Hochst a mixed acid containing a high proportion of sulphuric anhydride was used for the trinitration in T.N.T. manufacture, the waste acid being fortified for use in the dinitration stage, and waste acid from the nitration of dinitroanisol to trinitoanisol at the same works was fortified for subsequent nitrations, but with these exceptions no special care seems to have been taken to reduce the quantities of acid in circulation to a minimum. This may have been due to the fact that in the manufacture of dye intermediates, with which alone most of the factories were occupied before the war, it was customary to departmentalize on rather rigid lines, the acid departments being kept entirely separate from the nitration departments.

In the manufacture of picric acid at Dormagen, the strong acid method was employed, the plant being adapted to use phenol or dinitrophenol indifferently as a raw material. This method was in use in England for the nitration of dinitrophenol, and large scale experiments were carried out at Queen's Ferry to test its suitability for the nitration of phenol, but most of our picric acid was made by the older weak acid method. At Dormagen, cast-iron nitrators were employed, the picric acid being separated from the spent acid by vacuum filtration through filter beds of porous stone. These porous stone filters were in general use throughout the picric acid plant at Dormagen, and were also used in other factories for the separation of dinitrochlorbenzene and trinitroanisol from the waste acids. The separation of tetryl from its waste acid was effected at Troisdorf by use of centrifugals which were lined with cloth woven of nitrocellulose fibres.

Denitration of the spent acids from the manufacture of the nitro-explosives was effected partly in columns, partly in stills lined with acid proof tiles and heated by means of internal steam coils; the latter method seemed to have little to recommend it. The lining of the stills was excellent; the use of vessels rendered acid proof in this manner was frequently observed.

The manufacture of propellant explosive was carried out on established lines, as far as could be judged from the relatively small installations situated in the occupied zone The method for recovery of ether-alcohol vapors by means of sulphuric acid at Troisdorf was well worked out, and a recovery of 60 per cent. is said to have been effected, but this claim must be accepted with reserve. The use of glycol in place of glycerine is noteworthy, but does not appear to have been very satisfactory.

On the whole it may be said that, except for the employment of the strong acid method for the manufacture of picric acid on a large scale, and the separation of the isomers of mononitrotoluene (which was elaborated in the dye works before the outbreak of war), the German methods for the manufacture of explosives, as exemplified in the works situated in the occupied territories, were not superior, and in some cases were inferior, to the methods

in use in the big national factories erected in England during the war. The fact that none of the plants visited were in operation, and the difficulty of obtaining accurate data with regard to quantities and yields, makes comparison difficult, but it is doubtful if efficiencies in any of the German works reached the very high levels which were attained by the best English factories.

Poison Gases.

As the bulk of the gas used by the enemy had been made in the factories in the occupied zone, the Mission was able to get very full information both as to the method of manufacture and the scale of production.

The most striking feature was the fact that the bulk of the plant employed for the production of poison gas had been in existence prior to the war for the manufacture of dye-stuffs or pharmaceutical products. A certain amount of new plant had been erected, but this consisted mainly of standardized apparatus which had been used previously for peace production.

Another point worthy of note was the way in which the different stages of the manufacture had been allocated among the various factories according to the suitability of the available plant for particular operations. Thus, the production of thiodiglycol for the manufacture of mustard gas was carried out entirely at Ludwigshafen, where plant was in operation prior to the war for the preparation of ethylene and ethylene chlorhydrin, the thiodiglycol being sent to Leverkusen for conversion into mustard gas. In the same way several factories worked together in the preparation of the diphenylarsinic acid required for the production of diphenylchlorarsine.

A comparison of the facilities for the production of poison gas, existing in this country and in Germany at the outbreak of war, shows the great disadvantage at which we were placed in this respect. In this country, where the manufacture of organic chemicals had not developed before the war, there was practically no apparatus available which could be utilized for making the gases used during the later period of the war, and consequently all the plant required had to be designed and constructed, many months elapsing before output could commence. In Germany, where suitable plant already existed, supplies of a new gas could be manufactured in a much shorter time, and production on a large scale was greatly facilitated, thus illustrating the great military value of a well-organized dye and fine chemical industry.

Converting Dye Plants for Explosive Making.

No arrangements appear to have been made prior to the outbreak of war to utilize the resources of any of the dye factories for war purposes, and on mobilization their chemists were called up for military service. After the battle of the Marne the government realized the need for expanding the output of explosives, and most of the chemical works were producing small quantities by the end of 1914. The demands made on them increased during 1915, but it was not until 1916 that plant was laid down to assist in the enormous production of explosives required by the Hindenburg programme. Most of the big extensions of the synthetic ammonia and of the nitric and sulphuric acid plants date from this time, many chemists being released from the army and the scientific staff of some of the works being augmented. Standardized plant used for the manufacture of dyes was converted for the production of explosives with remarkable speed; for instance at Leverkusen a T.N.T. plant producing 250 tons per month was put into operation in six weeks.

Military Importance of the German Chemical Industry.

The figures for the output of explosives and gas show the great military value of the factories of the I.G. Combination. Although no arrangements had been made to mobilize them at the outbreak of hostilities they were rapidly converted to war purposes, thanks to their highly trained personnel, and the great technical resources of their peace organization. In the future it is clear that every chemical factory must be regarded as a potential arsenal, and other nations cannot, therefore, submit to the domination of certain sections of chemical industry which Germany exercised before the war. For military security it is essential that each country should have its chemical industry firmly established, and this must be secured as one of the conditions of peace, as otherwise we are leaving Germany in possession of a weapon that will be a permanent menace to the peace of the world.

The key to Germany's war production of explosives was the Haber process for the production of ammonia from atmospheric nitrogen. It is significant that large-scale production by this process only began at the end of 1912, and that in the early part of 1914 great pressure was put on the Badische Company to increase its output. In the event of another war we might be cut off from supplies of saltpetre while Germany would be independent of them.

The resources of the German dye industry are of no less military importance. Most of the gases employed towards the end of the war were complex organic substances, none of which had been made previously except in small quantities, and some of which were prepared for the first time during the war. Gas warfare will undoubtedy continue to develop in this direction, and in the future organic substances will be employed which we do not know of today. The use of gas will always offer great opportunities for surprise in military operations, and the experience of the present war has shown that rapid production of a new gas is essential if the surprise is to be effective. Any country without a well-developed organic chemical industry will be severely handicapped in this respect.

Thus at the time of the armistice Germany was left with a chemical industry which has a greater productive capacity than it had before the war. The general impression, however, gained by the Mission was that the technical practice in the factories visited was not markedly superior to that obtaining in England at the end of the war, and in some respects it was inferior. The main source of the strength of the German chemical industry appeared to lie in its organization and in the large scale of its production, which has been made possible by the ample financial support it had received.

By means of these advantages Germany had been able to cheapen production and establish a strong economic position, and to secure the development of the industry by the large sums devoted to technical research. However, the rapid growth of British chemical industry during the war proves that it can compete successfully with Germany provided that reconstruction is undertaken on a sufficiently large scale.

Process Engineers, Ltd., Montreal, report that they are closing their Montreal office for the present and all communications should be sent to their New York office, 501 Fifth Avenue.

LIGHT, HEAT AND POWER

Phases of the Canadian Fuel and Power Problem, With a Suggested Program, Designed With a View to the Economic Use of These Resources.

By LOUIS SIMPSON.

THERE can be no question that Fuel Supply is Canada's most important problem to-day, demanding the immediate consideration of Canadian citizens. No other question is of such widespread paramount importance, whether considered from a national, financial, industrial, or economic, point of view.

The consideration of the question is one that is peculiarly interesting to the engineer who has acquaintance with the data necessary for him to approach the question with expert knowledge; but it is also necessary that the question should be handled broadly, from the point of view of what is best for Canada.

It has seemed necessary to publish a third article upon this important question (previous articles were published in The Canadian Chemical Journal November and December, 1920), because of a certain article recently published in the Bulletin for February, issued by the Canadian Institute of Mining and Metallurgy, in which this question has been considered from the sole and selfish point of view of the Canadian coal operator, and in which the question has been so treated that the public very easily become misinformed as to actual conditions.

Let the whole truth be known!

Without fuel, or without the equivalent of fuel, the future of Canada would indeed be discouraging.

It is not sufficient to consider merely the supply of coal; the time has long since passed when coal was the only source of light, heat, and power. It is necessary to consider all the known sources of supply of fuel and fuel substitutes. Besides the supply of coal, there must be considered the supply of hydro-carbon oil and natural gas, peat, and lastly, but not least, of hydraulic and hydro-electric power.

Any investigation that ignored these factors, excepting perhaps that of peat, the influence of which, because of the peculiarities of the Canadian climate and other conditions, must of necessity be more or less local, would be misleading.

Hence quotations from authors of long ago, who knew not or who did not appreciate the importance of light, heat, and power production, by the combustion of hydro-carbon oils or by the use of hydraulic or of hydro-electric power, are so misleading that when used would at once lead to the assumption that the person quoting either did not understand modern conditions or else wilfully desired to mislead his readers. Such quotations as "A great stimulus to such a change will come wherever coal fields exist and the population will thrive and develop on the coal fields of the world, almost like flies upon honey," whilst partially true, are yet most misleading to the general public, who, as a rule, do not discriminate between cause and effect.

Yet another quotation: "With a population of ten millions, Canada should use 50 million tons of coal annually, if she is to achieve maximum manufacturing ability, freedom of political action and domestic comfort."

Coal fields themselves possess no special efficacy. The "stimulus" referred to above, comes not from coal itself, but from the economic use of coal, and like results follow the economic use of hydro-carbon oils, and of hydraulic or hydro-electric power. What difference can it make to the "10 millions in Canada" whether the light, heat, and power required for the production of "maximum manufacturing ability" or of "domestic comfort" is the product of the combustion of coal, or is derived from a coal substitute.

In some countries, and certainly in some sections of some countries, the use of hydro-carbon oil and of hydro-electric power is of more economic importance than is that of the use of coal.

Possibilities of Hydro-Electric Power.

Today, in the Provinces of Ontario and Quebec, no less than 3,000,000 h.p. have been or are in process of development; and Mr. F. H. Keefer, M.P., an engineer, and also a member of a commission that has cognizance of these matters, states 3,000,000 h.p. can be developed on the St. Lawrence, in that portion of the river which belongs to Canada, and lies within the Provinces of Ontario and Quebec, of which "only a small fraction has been used." Besides these powers, in other sections of the Provinces of Ontario and Quebec, it is possible to develop a further 2,000,000 h.p. Hence it may be claimed that, in the two provinces, there can be eventually developed about 8,000,000 h.p. It is a difficult question to be decided what one electric horse power year represents. Taking one electric h.p. year as being equal, when operated 10 hours per day, to the combustion of five tons of coal per year, there is arrived at the surprising total of 40,000,000 tons of coal.

Surely it is admitted that "A rose by any other name smells as sweet," therefore, whether light, heat, and power (the essentials of modern civilization), are produced chiefly from the combustion of coal—as in Great Britain; or from the development of hydro-electric power—as is possible in the Provinces of Ontario and Quebec, what difference can it make to the prosperity of a country, despite the dictum of Prof. H. Stanley Jevons, whom the writer is informed died years ago, or of Edwin C. Eckel, neither of whom were, or are, probably, acquainted with conditions in Canada.

The water-powers of the two provinces named, can produce more light, heat, and power than can be produced from the coal deposits of Nova Scotia; and the water-powers have this superlative advantage that, when so producing, the future supply is not being diminished nor is the future supply being made more expensive to produce, as would be the case from production in the Nova Scotia coal fields.

It must further be stated that where it is possible to operate these hydro-electric powers 24 hours per day, the power so produced would exceed that obtainable, under ordinary conditions, by the construction of nearly 100,000,000 tons of coal per year.

Last year the production of coal in the whole of Canada is given as being 16,623,598 short tons. The importation of coal into Canada may be roughly assumed as being about 20,000,000 short tons, so allowing for exportations, the total annual consumption may be assumed as being about 35 or 36 million short tons, a quantity large in itself, but insignificant when compared with the quantity of coal that is given as the equivalent of the hydro-electric power available in the two provinces.

The imports of coal into the Provinces of Ontario and Quebec in 1920 were over 18,000,000 tons, or about half the consumption of the whole of Canada.

Differences That Exist Between Use of Coal in Great Britain and Canada.

The writer has never been a producer of coal, but he has been a large user of coal, both in Europe as well as in Canada. He knows and appreciates the immense difference that exists between the delivery and use of coal in Great Britain, and the delivery and use of coal in Canada; a difference which British writers too often ignore, and which Canadian writers seem never to have appreciated. Fuel combustion engineers will, however, appreciate the difference between using coal loaded into cars (the coal being taken direct from the picking table) and which within a couple of days is delivered by cart (loaded direct from the cars) into the boiler house or perchance dumped direct from the cars into the boiler house, and coal that is first dumped into the hold of a steamer, then unloaded, and dumped into a barge, and again unloaded and dumped into a storehouse, or perchance loaded into a cart, and deposited on a dump. From the storehouse or dump the coal may be wheeled into the boiler house or it may be again loaded into a cart and lastly dumped into a boiler house. Every such handling or dumping operation increases expense, loss of material, and depreciation of quality.

Combustion experts can appreciate something of the losses consequent from such handling and use of coal. They can also appreciate the loss caused by exposure, by heating, and sometimes by fire.

Some materials can be carried long distances and can be stored for a considerable time without depreciation. It is not so with coal.

Limitations to Use of Canadian Western Coal.

It is necessary to once more point out that the conditions existing in Canada—conditions that cannot be ignored and cannot be altered—make it imperative that the fuel requirements of Eastern Canada shall, at all times, be considered separately from those of Western Canada.

The writer holds that it is economically impossible for the coal of the west to be transported and used to any extent in the Province of Ontario. To those who think otherwise, and who are open to conviction, the pamphlet lately published by the Quebec Board of Trade (being a copy of a "Memorial submitted to the Railway Commission of Canada" under date 3rd February, 1921), together with the figures lately made public in the House of Commons respecting the cost of operating Canadian railways, will be illuminating. It would not be difficult to prove to those who desire the truth, that Western mined coal cannot be economically shipped in any quantity east of Winnipeg.

The desire, so painfully evident in certain quarters, to force coal to be used in locations where local conditions make such use non-economic, is not to the interest of Canada, and the sooner this important question comes to be considered from the national standpoint of Canada's best interest, and not as to the present advantage of a few operators, the better for Canada.

The author claims that:

(1) The question of Canada's fuel supply cannot be intelligently considered unless the situation in East Canada be separated from that of West Canada. Whilst the coal supply of the East is limited in extent, it is supplemented by large potential possibilities for hydro-electric power development, and by large deposits of oil-bearing shales.

(2) That oil can, considering relative efficiencies as fuel, be more cheaply transported than can coal.

(3) That the economic production of light, heat, and power require simultaneous production, not alone of coal, but also of oil and of hydro-electric power.

(4) That with all three available, it is not statesmanship to permit the continuous importation into Canada of coal and oil to an extent requiring the loss to Canada of funds to the amount of over $250,000,000 per year.

(5) That this drain upon Canada's monetary resources is the cause of the present condition of Canadian and United States monetary exchange, with the result that Canada has been penalized from 12 per cent. to 18 per cent. when purchasing from the United States necessities of life and of trade.

(6) That import duties preventing the exploitation of Canada's natural resources should be done away with, especially of such resources as undeveloped hydro-electric power, and oil yielding shales, the exploitation of which would permit of the conservation of the limited coal resources of Eastern Canada.

(7) That Canada's eastern coal resources be conserved in the interest of Canada's steel industry.

In conclusion, the following example is given, as showing how the coal situation, and the consequent high prices that have prevailed for coal during the past season, has affected Canada's manufacturing industries.

A large manufacturing concern with coal consumption of 15,000 tons per year, also used 10,000 hydraulic and hydroelectric h.p.

Before the war their coal cost them $4 per ton delivered. At an increase of $10 per ton their fuel costs were augmented by $150,000.

Had all their power requirements been obtained from the combustion of coal, their coal consumption would have been increased by no less than 50,000 tons. The cost of this increase calculated only at the increased cost of the coal would have totalled $500,000, and the company would have been unable to provide for bond interest and full depreciation, consequently there would have been no surplus of profits wherewith to pay dividends to their shareholders.

(Signed) LOUIS SIMPSON.

PERSONAL.

Mr. C. R. Walker, president Cross Fertilizer Co., Ltd., Sydney, Nova Scotia, accompanied by Mr. Charles Davidson, technical manager, Alex. Cross & Sons, Ltd., Glasgow, Scotland, the parent organization, made a tour of the important fertilizer plants in the United States during the past month with a view of getting new ideas for the new Cross plant to be erected at Welland, Ontario.

O. G. Lye, B.A., Sc., F.C.I.C., has resigned his position as technical manager, Malt Products of Canada, Ltd., Guelph, Ont., to accept an appointment as a patent examiner with the Dominion Government at Ottawa.

Mr. W. B. Campbell, formerly with the Process Engineers, Ltd., Montreal, has taken a position with the Provincial Paper Mills, Ltd. He is stationed at the Georgetown, Ont., mill, and will supervise general chemical and engineering activities of the company.

Progress in the Manufacture of English Chemical and Scientific Glassware

By J. H. DAVIDSON*.

AMONGST users of chemical and scientific glassware and lamp worked apparatus it is common knowledge that previous to the outbreak of the great war in 1914, practically the whole of the production of this type of glassware was in German and Austrian hands, and thanks largely to cheap labor and competition between the manufacturers themselves, such glassware was obtainable at very reasonable prices.

With the outbreak of the war conditions were completely changed and when the stocks in hand became exhausted the position became extremely critical. Though at first sight laboratory ware may not seem one of the things essential to national welfare, a little consideration will show that the successful prosecution of the war and the subsequent progress of many essential industries was largely dependent upon chemical control and research, and therefore upon the acquisition of suitable glassware for the purpose.

Without unduly elaborating the point, mention may be made of the testing of steels for various purposes such as gun making, armor plating, cutting tools, etc., and the large amount of laboratory work essential in the manufacture and research work in connection with the dye industry. Special alloys in connection with aeroplane work were required and obtained but their constancy of composition and the properties consequent upon this, upon which the value and safety of the aeroplane service depended, had to be carefully controlled by chemical analysis. Thus, although the intrinsic value of the glass required was comparatively small, its importance in the furtherance of other industries was extraordinary.

A New Industry For Britain.

At the outbreak of war no British glass manufacturers made a specialty of laboratory ware and what was practically a new industry had to be established. At first sight it may not seem a difficult matter for a firm accustomed to glass manufacture to turn from one branch of the trade to another, but in this particular instance the difficulties were great, and even at the present day many problems face the manufacturer of chemical glassware.

In the first place, the composition of the glass had to be very different from that to which they were accustomed. Whereas in table ware or ornamental glassware brilliancy and purity of color were the chief essentials, the properties requisite for good chemical glassware were very different. Foremost amongst these may be placed (1) the resistance of the glass to attack by acid and alkaline solutions, frequently under rather drastic conditions, and (2) the "thermal endurance" of the glass or its property of resisting sudden temperature changes without fracturing. Whereas good table ware was generally made from soft, i.e., easily fusible glass, the properties inherent in good chemical ware were only obtainable by the use of a very much "harder" or less fusible glass. A special committee of the Institute of Chemistry was appointed to deal with the question and in April 1915 Professor Jackson's formulae for types of glass not previously made in Britain were published. Adopting some of these as a basis and developing them according to experience certain British firms began to manufacture scientific glassware while others started manufacturing on lines suggested by their own scientific experts, and though the difficulties met with in the earlier stages were very great, they have been surmounted, and at the present day the best class of British chmical ware can compare favorably with any in the world.

Technical Difficulties Overcome.

The glass requisite for good laboratory ware was much less fusible than the glasses to which manufacturers had been accustomed. This entailed higher temperatures ruling in the furnaces in order to get the glass plain and free from "seed." In many cases the design of the furnace had to be altered or an entirely new furnace built to meet these requirements and also great care had to be exercised in selecting the refractory materials from which the furnaces and glass pots were made, since not only were higher temperatures necessary, but the particular type of glass had a much more strongly corrosive effect upon the glass pots than the types more generally in use.

Further, the manipulation of the molten glass brought in fresh difficulties. Skilled labor in this branch was unavailable and all workers had to be trained. The articles produced such as beakers, flasks, etc., had to be very thin and even walled throughout to avoid subsequent cracking in use through unequal expansion. The "metal" being hard and cooling quickly, had to be manipulated more rapidly and at a higher temperature than articles of a similar thickness but made of a softer glass, such as electric lamp bulbs. The correct manipulation of the metal could only be obtained by experience and in the early stages the results were not always very successful, but with further practice great improvements were speedily effected and an uneven beaker or thick-bottomed flask is now an exception. In the early stages of the developments, beakers were "cracked off," rims turned and lips added entirely by hand but more recently these processes have become to a greater or less extent automatic with a corresponding improvement in the uniformity of the articles produced.

Great difficulty was experienced in the efficient annealing of the glassware. After softening to turn the rim and add the lip of a beaker, or put the side tube on a distillation flask, strains were developed in the glass which caused the finished articles to be liable to fracture in use. This difficulty had to be met by paying very particular attention to the annealing of the glass, and the results have proved satisfactory. Considerable research work was done on the subject of the annealing of glass and instruments devised for securing its scientific control** and manufacturers have taken advantage of the information supplied so that chemical glassware is now thoroughly annealed.

Results of Tests on British Glassware.

As regards the resistance of the glass to attack by chemical reagents, acid or alkaline, very thorough tests were carried out in the Department of Glass Technology,

*With Messrs. Wood Bros. Glass Co., Ltd., Barnsley, Eng.

**See Twyman, Journal of Society of Glass Technology 1917. 1. 61. and English & Turner 1918. 11. 90.

University of Sheffield, and the results were published in the Journal of the Society of Glass Technology (1917 1. 153.). Many types of chemical glassware were compared. No one type was pre-eminent in all the tests. One glass might be superior to others say as regards resistance to alkaline solutions and slightly inferior in respect to acid solutions, or vice versa, but the paper concludes: "Taking all the tests into consideration, the six best glasses are B.C.D.E.F. and G. and **this list includes all the British glasses in the market.**

Jena glass A. comes "seventh on the list." This verdict, after an exhaustive series of tests carried out by an unbiased and thoroughly reliable authority surely speaks highly for the manner in which British manufacturers have tackled their problem and overcome their handicap.

Highest Standard Demanded by Britain.

In the case of graduated apparatus the progress made has been equally satisfactory and in regard to appearance, clearness of line, and particularly accuracy of graduation British graduated apparatus need fear no comparison. Where specially accurate apparatus is required for research work this can be obtained with a certificate of accuracy from the National Physical Laboratory. The limits of error allowed by this authority are more stringent than those permitted by the Charlottenburg Reichsanstalt whose stamped graduated apparatus was generally accepted as a standard of accuracy in pre-war days. For ordinary technical or educational purposes the average product of a British firm is quite adequate and though it is manifestly impossible to check every piece of graduated apparatus sent out without increasing its cost greatly, the control exercised over the graduation by trained scientists and new or improved methods of graduation render the product quite trustworthy and on the average a considerable improvement on Continental graduated apparatus.

The production of special apparatus from glass tubing by the blowpipe has also been developed greatly. Scientific research devoted to the problem has resulted in the production of types of glass exceptionally suitable for this purpose in that they are soft and easily workable and yet do not blacken or devitrify when heated in the blowpipe flame and also do not develop "bloom" when repeatedly softened and blown as is necessary in the production of some of the more complicated types of apparatus. British manufacturers started in the chemical and scientific glassware industry less than six years ago. They do not claim to have reached perfection, but they can point with pride to the enormous progress made which has enabled them to produce scientific glassware equal to any in the world after only a few years' experience, and development is still proceeding rapidly.

PUBLIC HEALTH CONVENTION LARGELY ATTENDED.

The Convention of the Ontario Public Health Association, held at Toronto during the week of May 16th, was largely attended and proved the most successful yet held by the Association. A feature of the convention was the exhibit of apparatus of interest to bacteriologists, public health laboratories, etc. Prominent among the exhibits were the displays of Canadian Laboratory Supplies, Ltd., Toronto, and J. F. Hartz Co., Ltd., Toronto.

ACTION OF LIGHT AND OXYGEN ON RUBBER.

In a paper read before the Faraday Society recently, Mr. B. D. Porritt directed attention to the important role which oxygen plays in all the changes which take place during the storage, manufacture, and usage of rubber. Over one hundred years ago it was found that exposure to sunlight and air resulted in rapid deterioration, and it is now known that these changes take place in two stages—the first, technically known as "tackiness," mainly being a physical change in which oxygen functions essentially as a catalyst, the rubber becoming soft and sticky, and being characterized by a low-solution viscosity, while the second—known as "perishing"—consists in chemical oxidation with the initial production of a soft, sticky, oxidation product which is subsequently transformed into a brittle resin of indefinite composition.

The effect produced on the viscosity of a solution of rubber exposed to light, and the protection afforded by the introduction into the solution of a powerful absorbent of ultra-violet radiations, was shown by means of a slide. From this, the author said, it might be assumed that a rubber of low viscosity would be more prone to oxidation than one possessing normal characteristics, but such is not of necessity the case, and, as seen from another side, the process of mechanical working known a "mastication" or "milling" also results in a very rapid alteration in the viscosity, but the product of this operation—unless carried to extremes—does not present the other physical characteristics of natural "tackiness," nor does it appear to be more liable to oxidation either as kept in the factory or when exposed to light in solution. It is probable, therefore, that in the case of depolymerisation of rubber by the action of chemical combination occurs with the formation of some compound which acts as an oxidation catalyst. The changes in the solution viscosity of rubber produced by milling, moreover, appear to differ from those resulting from the action of light and air, in that in the former process, if the treatment has been light, the material tends to regain its original characteristics in the parts shielded from contact with air.

As regards the effect produced by light and air on rubber when sulphur is also present, it is an interesting historical fact that the first process of vulcanization employed by Goodyear consisted in exposing rubber-proofed articles to sunlight, a process known as "solarization," and by the use of a quartz mercury vapor lamp it has recently been found that a rubber sulphur solution, even in the presence of air, rapidly sets to a permanent "jelly" accompanied by the combination of a small proportion of the sulphur. In ordinary daylight, however, the presence of sulphur, if anything, accelerates the reduction in the viscosity of a rubber solution, and in the presence of air appears to inhibit the formation of a "jelly" which otherwise speedily occurs. It is perhaps interesting to note that on re-exposure to air this "jelly" is again rapidly liquified.

Had it not been for an accident, it is probable that the effect of oxygen as a negative vulcanization catalyst would have set back the development of the rubber industry by many years. Goodyear's chance discovery of vulcanization in 1839 must be attributed to the presence of lead compounds as well as sulphur in a sample which was by chance heated in front of a fire, since subsequent technical experience has shown that to ensure satisfactory vulcanization the exclusion of air is necessary unless some positive catalyst such as litharge is present.

RECOVERING NEWSPRINT*

By Charles Baskerville and Reston Stevenson.†

THE patent literature and a recent book‡ on waste paper recovery describe processes for de-inking paper without discriminating between newsprint stock and bookstock. The known processes which give satisfactory results for bookstock are not necessarily applicable to old newspapers, primarily on account of the notable proportion of ground wood present in newsprint stock.

This communication presents a process by which the ink and binder and oil are removed from old newspapers with minimum injury to the fibre, and the pulp is furnished ready for use again for newsprint.

In our experiments we used a laboratory pulper with electrically driven propeller, a wooden box with brass gauze bottom as washer, a brass disk-maker with brass gauze bottom, a book press, and air drying. This was according to the practice familiar to a paper mill laboratory. The following conclusions give the result of about seven hundred experiments:

When printed papers, e.g., old newspapers, are mixed with water, and pulped and washed, the ink is partly removed. The greater part of the ink remains, because:

(1) The binder of the ink is not removed.

(2) The carbon of the ink is entrapped in the pulp.

(3) The carbon of the ink adheres to the pulp.

A well-known method for bringing the binder into solution or emulsion, or at least removing it from the fibre, is to treat the pulped paper with a water solution of an alkali. Too little alkali does not entirely dissolve or emulsify the binder, nor does it liberate completely the pigment of the ink; on the other hand, too much alkali is harmful in that it yellows wood pulp, which is a prominent constituent in newspaper stock. Also, too excessive alkali tends to mercerize the fibre, and too much alkali makes the carbou remain in the pulp in such a condition that it does not wash out.

We have determined that 60 lbs. of caustic soda per ton of old newspapers is the optimum concentration of alkali. We have found that 200 lbs. of soda ash per ton of old newspapers gives as good, if not better, results, especially in regard to the yellowing of the paper. The soda ash is much more easily handled.

The use of alkali alone is not sufficient to liberate the ink so that it can be washed away. We have worked out a method which completely frees the pulp from the ink, binder, oil, and pigment. It consists essentially in the addition to the alkaline solution of American fuller's earth, which remains in suspension or in colloidal solution. We have found that approximately 100 lbs. of this earth to a ton of old newspapers is sufficient, but if used in greater proportion, the effect is slightly better.

The effect of the suspended material appears to be a double one. it removes the oils of the binder, and it attracts the carbon away from the pulp and holds it. Upon subsequent washing with water the pulp may be retained by a gauze or screen, and the minute particles of suspended material which hold the finely dispersed carbon and some oil are washed away.

The best temperature for the procedure is about 50° C. The less the concentration of the pulp, while the ratio of chemicals to old papers remains constant, the greater is the de-inking effect. For practical reasons, a pulp is rarely less than 2 per cent. The alkali and suspended material should be placed in the pulping machine with the water and heated to 50° C. before the addition of the old newspapers. The paper must be perfectly pulped, which may be accomplished by various machines within a period of less than one hour. The pulp must be thoroughly washed, requiring about one-fourth less water than for bookstock.

The resulting product is free from carbon and oil, and has only a faint yellow coloration. It is ready for immediate use for making newspaper.

The product obtained described in the last paragraph may be bleached by treatment with a solution of sulphur dioxide, which gives a product as white, if not whiter, than the original unprinted paper. In practice the bleaching has been accomplished in 15 minutes by the use of 20 lbs. of sulphur dioxide in cold water, per ton of old papers.

*Presented before the Division of Industrial and Engineering Chemistry at the 60th Meeting of the American Chemical Society, Chicago, Ill., September 6 to 10, 1920. Patent applied for.

†Department of Chemistry, College of the City of New York.

‡Strachan, "The Recovery and Re-manufacture of Waste Paper," The Albany Press, Aberdeen (1918).

REGENERATING BOOKSTOCK.

At the Chicago meeting of the American Chemical Society, September, 1920, in addition to the presentation given above on "Recovering Newsprint," a paper on "Regenerating Bookstock" was presented by Dr. Baskerville and C. M. Joyce. This paper stated, in part:—

With the exception of the cheaper grades of magazines, sulphite, soda, or sulphate pulp constitutes the larger portion of the cellulosic basis of the paper used. Some mechanical pulp is used in the cheap grades of magazines and light reading matter. Bookstock carries more or less filler and sizing, very variable in character and quantity. Other cellulose fibres, cotton, linen rags, esparto, etc., enter into book paper, which may become a part of an assemblage of waste paper. Inks of various compositions and colors have been used on the collected waste.

The economies involved in "Recovery and Remanufacture of Waste Paper"[1] are interestingly brought out by Strachan, although he does not deal with an important phase of the subject particularly of concern in the United States. The reworking of waste paper for the manufacture of boxboard, roofing, etc., has developed to a considerable industry in the United States, and the demand for such promises increasing growth. A marked differential for boxboard, of immaterial color, and sheets for printing will undoubtedly always obtain, but whether it will economically carry the burden of regeneration is a question debated, but as yet unsettled, for a general policy in national conservation by some of the largest paper producers in this country. However, at this particular time and for some years to come, the regeneration of bookstock means conservation and profit.

Various processes, either mechanical or chemical in nature, or both, have been proposed for special papers (photographic, waxed, etc.) and some of them are in

[1]James Strachan, 1918.

practical use to a limited extent. Many of the processes, when tried on a commercial scale with the general run of waste paper, fail to give the superior pulp desired for book paper. The failure is due in some instances to the fact that in the mechanical pulping of the stock the ink pigments are driven into the fibres, necessitating drastic treatment for separation, which shortens and weakens the fibres, as well as incurring (uneconomical) losses in washing the pulp. To secure the best results mechanically, the fibres require to be loosened and then drawn, not torn, from the matter. Devices have been constructed to meet the mechanical difficulty, but they involve time and power factors with mounting costs of operation.

Normally bookstock is a cellulosic fibre which has had severe chemical treatment. On the principle that the binder of printing ink was a saponifiable oil, caustic solutions have been and are used to "lift" the pigment from the fibre, which, if ground wood pulp be absent, and if the concentration of the caustic be regulated, and if the temperature be not too high, serves to remove a large proportion of carbon ink. Too great a concentration may bring about some mercerization. More weakly alkaline solutions, for example, sodium silicate, sodium phosphate, borax, soap, etc., also lift the ink in part and do little damage to the fibre. However the detergent effect calls for scouring or rubbing, which so embeds the carbon in the fibre as to make it almost impossible to separate the two.

Certain solvents, as kerosene or gasoline, tend to loosen the ink by dissolving the binder. This may be combined with an alkaline solution, for example, a borax or a soap solution. During agitation the suds or skim, which forms on the surface of the water and entangles the carbon particles, may be washed away.

Rosin is extensively used as a filler and binder for the fibres of the paper, which have a "surface." As mentioned, some of the cheaper magazine papers contain wood pulp, which retains natural gums and resins. They serve in part as binders for the ink pigments. Pine oil is one of the normal solvents for rosin, gums, and resins, so its addition to the old printed matter helps materially to lift the ink.

In practice in reclaiming bookstock, we have therefore used borax (10 lbs.), soap (10 lbs.), kerosene (2 gal.), and pine oil (2 gal.) to 2,000 lbs. of bookstock in water to make a 3 to 6 per cent. pulp. The stock is soaked and gently pulled apart in a beater or other device, thus reducing the mechanical injury to the fibres to the minimum. Time is saved by heating the mixture up to 75° to 90° C. by introducing live steam. After pulping, which requires one hour or less, depending upon the machine used, the ink and chemicals are washed away by one of several well-known washers. The pulp may then be bleached or tinted as desired. A selected combination of the chemicals may be used instead of all four with selected lots of waste paper when the composition (including ink and the binder) is known.

A superior product of desired strength, length of fibre and cleanliness has been obtained by the process[2].

The University of Buffalo, Buffalo, N.Y., will build a three-story chemistry building at Niagara Falls Boulevard and Main Street, to cost about $400,000.

[2] U.S. Patent 1351092.

SUNSHINE SOURCE OF FUTURE FUEL.

Sun energy may be changed some day into a substitute for coal and other fuels, said Dr. J. Howard Mathews, of the University of Wisconsin, before the Chicago Section of the American Chemical Society April meeting, in the last of a series of lectures on photo-chemistry delivered before the various Sections of the Society.

"With constantly diminishing reserves of fuel,' 'said Dr. Mathews, "the question of the utilization of the radiant energy from the sun becomes more and more of a live question. What will the world do when fuel is gone? Such a possibility is, at least, geologically speaking, a question of the almost immediate future. Hundreds of millions of horse power of energy are coming continuously from the sun. How can this energy be stored up and transformed into a useful form of force? The optimistic photo-chemist believes that it can be employed to bring about certain chemical reactions, which, by their reversal, will again liberate it, preferably in the form of electricity. The dream is no more chimerical than was that vision of a hundred years ago, in which electricity was conceived as stored and utilized."

Dr. Mathews remarked that the farmer was a practical photo-chemist, and the growing of crops the greatest of all photo-chemical reactions. With the aid of that mysterious substance, chlorophyll, which imparts the green color to the leaves, the agriculturist calls on the sun to combine water and carbonic acid gas to form the starches and sugar of plants. Chlorophyll unites various elements which make up vegetation and is therefore a catalyst.

Dr. Mathews concluded that the task of the photo-chemists is to study all possible types of reactions produced by all kinds of radiation. By that means they may gain more thorough knowledge of the laws and principles involved, with a view of making in the future many important and practical applications.

BACK NUMBERS WANTED.

Copies of the March issue, 1921, Canadian Chemistry and Metallurgy are wanted; also copies of the March, August, and September, 1920, Canadian Chemical Journal. Any subscriber sending in copies of these numbers will have their subscription extended two months for each copy received. For example, anyone sending in all four would have their subscription extended eight months.

CAMBRIDGE PROFESSOR HONORED.

Presentation of the Chandler medal to Frederick Cowland Hopkins, professor of biological chemistry at Cambridge University, England, "to recognize publicly his pioneer and very valuable work in the study of food accessories such as vitamines," was made April 18th in Havemeyer Hall, Columbia University, under the Charles Frederick Chandler Foundation established by friends of Professor Chandler in 1910 to provide each year a lecture by an eminent chemist and to present a medal to the lecturer. Professor Hopkins delivered the annual Chandler lecture discussing "Newer Aspects of the Nutrition Problem."

NEW YORK OFFICE OF INTERNATIONAL NICKEL CHANGED.

The International Nickel Company announce the removal of their offices to 67 Wall Street, New York City.

THE TALC INDUSTRY IN 1920

By Raymond B. Ladoo*.

THE production of talc in the United States in 1920 was probably the largest in history. Preliminary reports from ten companies which include most of the large producers indicate an increase of about 26% in tonnage over 1919, and an average increase of 6.75% in price per ton, or about 34% increase in total value. If these averages may be accepted for the whole industry a total production of 213,000 tons valued at about $2,360,000 is indicated. These figures may be too high, as production fell off during the last two months, but they serve to indicate the general tendency. The estimated total production for 1919 was 170,000 tons, with a total value of $1,766,000. The largest previous production was 198,613 tons, in 1917, and the largest total value was $2,089,960, in 1918. Price changes varying from no increase to 25% increase during the year were reported. The largest producers reported little increase in price, as is shown by the 6.75% average.

Imports of talc were larger than ever before. Incomplete reports indicate total imports of more than 24,000 tons, valued at over $475,000, which includes about 1,000 tons of crude talc with a value of about $8,000. Imports in 1919 were 14,602 tons, valued at $259,004, compared with the previous record tonnage reached in 1916 of 18,882 tons, valued at $230,875. The 1920 figures indicate an increase in tonnage of about 40% over 1919, and of about 25% over the previous record. The average declared value of imported talc per ton in 1920 was about $20, as compared with about $17.50 in 1919, an increase of 14%. About 70% of the imported talc came from Canada, about 20% from Italy, about 8½% from France, and the rest 1½%, was from England (probably originated in India), Austria, British West Indies, Denmark, Germany and Sweden. The Canadian talc had an average declared value of about $16 per ton, the Italian $35, the French $15, the British (Indian?) $50. From these figures it appears that the chief competition which domestic producers must meet is that of Canadian talc, much of which is of very high grade, suitable for the toilet powder trade, and which sells for a comparatively low price.

The Stuation in the United States.

As indicated by the production figures, 1920 was a very busy year for the talc industry in general. With very little additional plant capacity a record production was made. The demand was very strong up until about November, when the general business depression was strongly felt. At the close of the year, new orders were very scarce, production had started to decline and stocks of finished talc in the hands of producers were large and increasing, due to the catching up on unfilled orders, and lack of new business. Some producers reported orders booked for over 50% of capacity for 1921, while others reported no orders booked; but a general attitude of optimism for the new year was evident. No general decline in talc prices in 1921 is looked for, as the prices of talc have not largely increased since 1914. The average value of talc in 1920 was only about 13.5% greater than that of 1914. Labor supply was adequate, but not plentiful, with wages remaining about the same. Car shortage hampered shipments for over half the year, resulting in the maintenance of many unfilled orders on the books. Numerous inquiries for spot shipments sent to several producers simultaneously made a further apparent increase in demand. Most of the producers, however, met the demand by increased efficiency and capacity output. A few expansions in capacity were noted, but on the whole they were unimportant.

Toward the close of the year new plant capacity, building or contemplated, amounted to nearly 300 tons per day, or 90,000 tons per year. The country probably can not absorb this additional capacity for several years at a normal rate of increase, but new uses which would take care of it might be developed through research and publicity. However, it is not likely that much more than a third of this projected plant capacity will actually be built and placed in operation.

Little progress was made in the development of new uses which would absorb large quantities of talc, most of the production going into the paper, roofing, paint, rubber and textile industries. One previously known use, however, as one of the principal ingredients in fire-retardant paints, received an impetus due to the publication of favorable results of tests on these paints and the licensing of paint companies to manufacture them. This use should call for an increasing quantity of talc in the future.

A meeting of the Talc and Soapstone Producers' Association was held in New York in April, 1920, at which a constitution was formally adopted. Funds were also appropriated for research work, but they have not yet been made available and no further progress in this direction was made.

The opening of no new talc deposits has been reported, but a few old deposits were reopened in a small way. Several small companies went out of business or ceased to produce during the year. Talc specimens from undeveloped deposits, of a grade suggesting possible commercial importance, were received from Virginia, Alabama, Nevada and Montana. It is reported that the Montana deposit will be developed and operated in 1921.

Vermont and Massachusetts.

Vermont continued to lead in the production of talc by tonnage and possibly by value with a production of more than 94,000 tons valued at over $830,000. Few new developments were reported, high prices and labor shortage discouraging new building. However, the American Mineral Co., at Johnson, Vermont, has built a new mill, increasing its daily capacity from 70 tons to 200 tons. This mill, which is electrically driven, is expected to be ready for production early in 1921. The sinking of a new and deeper shaft at the mine with additional mining machinery is contemplated. No new companies were reported.

The only producing talc mine in Massachusetts is at Rowe. This mine was reported sold in 1919 to the International Talc Co., but the sale was never completed and the mine reverted, in 1920, to its former owners, the Foliated Talc Co. The latter company continued operations during the year.

New York.

The only important development in New York State was the erection of a new talc mill by the W. H. Loomis Talc Corporation on the Edwards branch of the New York Central R.R., about six miles from Gouverneur. This mill is not yet completed, but the company operated its mine during the year, selling crude talc. The Uniform Fibrous Talc Co. continued development work in their new shaft, but did not bring their production up to normal. Control of the St. Lawrence Talc Co., whose plant is located at Natural Bridge, New York, passed to the Carbola Chemical Co. with no change in management. Prices of New York

*Mineral Technologist, U. S. Bureau of Mines.

talc in general advanced during the year more than in other districts. One producer expresses the opinion that consumers will not be inclined to place long-time contracts in 1921, due to the business depression, and more talc will be sold on an open order or current price basis. Production probably declined, somewhat due to shortage of electric power, labor shortage, transportation difficulties, etc. For the past few years it has been evident that the talc production of New York has not increased in proportion to the Vermont production, and in some instances it has actually declined. There appears to be no fundamental reason for this, as there is a good demand for New York talc and the deposits are by no means exhausted.

California.

California stands third in the production of talc in the United States. During the last few years the increase in production has been very rapid, rising from a previous maximum of 1,159 tons in 1912 to 10,364 tons, valued at $170,775, in 1918. Figures are not yet available for 1919, but in 1920 one company alone reported a production of about 8,000 tons, valued at about $170,000. Most California talc is of high grade and is sold largely in eastern markets to the toilet powder trade in competition with imported talc. The large increase in freight rates and the increase in imports have made this competition increasingly difficult, and at the close of the year most of the mines and mills were inactive. No large price reductions can be expected, due to the high costs of mining and milling. The use of California talc in paints and as a filler for cotton cloth and paper has largely increased. The development of new deposits at Richardson Siding, near Folsom City, Sacremento county, has been reported.

Pennsylvania and New Jersey.

The production of talc in the Pennsylvania-New Jersey district has always been small and no large increases were reported in 1920. One new company began operations, the Rock Products Co., Easton, Pa., reopening a quarry at Philipsburg, New Jersey.

Southern District.

The talc industry in the south was not very active in 1920. There are no large producers of ground talc in this district, but it supplies a large proportion of the talc crayons used in this country. In Maryland there was no production of ground talc, but a few hundred tons of crude talc were shipped. The Harford Talc Company, Inc., which now mines practically all of the domestic talc suitable for lava gas tips, etc., continued its production. It is reported that the quality of the talc mined is increasing with depth. A 500-foot span cableway was installed during the year. In Virginia, the property of the Franklin Soapstone Products Co. was sold to the Blue Ridge Talc Co., Inc., who began operations on June 10th. This company produces ground soapstone at Henry, Va., and is planning the installation of a Raymond 4-roller mill to provide a greater production of finely ground material. In North Caroline and Georgia the production of talc crayons increased 10 to 20% over that of 1919. Little ground talc was produced. Many of the talc mines of this district are handicapped by their distance from a railroad and the poor waggon roads, making it uneconomical to haul anything but crayons or high grade crayon stock. In Madison county, North Carolina, a new county road is being graded which will bo of great value to the mines nearby. The Talc Products Co., at Glendon, Moore county, North Carolina, is contemplating the erection of a modern grinding plant with a capacity of 50 to 100 tons per day. The Georgia Talc Co. reports that they have increased their talc grinding capacity at Chatsworth, Georgia, by the installation of a Fuller-Lehigh mill. Several companies in the Georgia-North Carolina district have been in difficulties, financial and otherwise, which have resulted in low production or closing down. On the whole it was a difficult year for the talc industry of the South; but improvements will come through consolidation, increased capitalization and more careful management. Talc discoveries near Evington, Campbell county, Va., and near Talladega, Ala., which may be of commercial importance, have been reported. At the end of the year demand had fallen off greatly both for crayons and for powdered talc, but no price-cutting was evident.

Foreign Situation.

Before the war most of the talc imported into the United States came from France and Italy at an average rate of about 4,000 tons per year from each country. The war caused little difference in these imports, except that those from Italy increased to over 7,000 tons per year, until 1917, when those from France dropped to about 1,500 tons and from Italy to about 4,100 tons. In 1918 the imports from France fell to 22 tons and from Italy to 490 tons. In 1919 there was but a slight increase over 1918. In 1920 the indicated imports from France were about 1,900 tons and from Italy about 4,400 tons. In the absence of definite information it appears that the talc industry in Italy has recovered to its pre-war efficiency, while that of France has only partly recovered.

Canadian Production.

The talc production of Canada has increased steadily during the last ten years and as a large part of the Canadian talc is exported to the United States, the increase can be followed approximately from the imports into this country. Practically all of the talc produced in Canada comes from near Madoc, Hastings county, Ontario. The three companies, George H. Gillespie & Co., Ltd., Madoc, Ont.; Anglo-American Talc Co., Ltd., Madoc, and the Eldorado Mining and Milling Company, Ltd., Eldòrado, are producing ground talc. Of these companies the George H. Gillespie Company is probably the largest and ships the highest grade of talc. The mine and mill are efficiently operated and had a prosperous year. It is reported that the erection of a new mill of larger capacity is contemplated. According to reports of the Ontario Department of Mines, the Eldorado Company does not produce a real talc, but an altered siliceous magnesian limestone. A dark gray talc, called "gratalc," is ground in a separate mill.

No important talc production has come from the other provinces in Canada; but it is reported that a large deposit of talc was blocked out by diamond drilling in Quebec, just north of the Vermont line. This work was done in 1920 by a United States company. In British Columbia the British Columbia Silica and Talc Co., Vancouver, B.C., was formed to operate silica and talc mines near Hope, about 100 miles east of Vancouver.

In South Africa there are four districts in which important deposits of talc are found. Two of these, the Barberton district and the Krugersdorf district, are in the Transvaal, the third is in Zululand, and the fourth in Southern Rhodesia. The most important district is the Barberton, though very good foliated talc is found in Southern Rhodesia. The talc reserves in the Barberton district are enormous and could be developed to produce a very large tonnage. In 1920 there were only three producing companies, the Scotia Talc Mine, Ltd., Joe's Luck, Barberton, Transvaal; The Verdite Mine, Jamestown, Barberton, Transvaal, and B. R. Berrett, Greytown, Natal. The first two named are the largest producers, the former

having a capacity of 2,000 tons crude talc or 1,000 tons ground talc per month, and the latter 200 tons ground talc per month. The shipping port for the Scotia mine is Delagao Bay, 120 miles from the mine. While the total talc production of South Africa was only 757 tons in 1919 plus a few hundred tons (412 tons in 1917) of manufactured talc goods, the industry seems to have great potential possibilities both for domestic use and for export.—U. S. Bureau of Mines, Reports of Investigations.

ALKALI DEPOSITS OF WESTERN CANADA*

By L. H. Cole.

NATURAL occurrences of soluble mineral salts are known in the provinces of Manitoba, Saskatchewan, Alberta, and British Columbia, either in the form of bedded deposits, or as brines. Some are of considerable extent, and are probably of sufficient size to warrant commercial development.

The occurrences of these salts may be broadly classed under two types:

(1) SOLID SALTS AND BRINES IN UNDRAINED OR PARTIALLY DRAINED BASINS;

(2) BRINES OF FLOWING STREAMS OR SPRINGS.

Type I.

Those of the first class are very numerous in the prairie provinces.

It is probable that the accumulation of salts is due to leaching out of the soluble salts in the prairie soils by surface waters, and their concentration and deposition in the undrained basins which are found in the glacial morainic covering of the western prairies.

These deposits are generally of a similar character, although the percentage of the different salts will vary in different localities. In many cases the name "alkali lake" has been appropriately applied to deposits of this nature, since in the early spring and often into late summer the deposits are covered with water. The water accumulating through the melting snow and rain is often a foot or two in depth, and carries a considerable quantity of the alkali salts in solution. Beneath this water one generally finds a solid bed of crystallized salts. In the late summer, especially when the season is a dry one, these so-called lakes become deposits of snow white alkali, which, when seen from a distance, resemble snow covered basins.

The deposits will vary in size from a few acres to many acres in extent, and in thickness, from a few inches to possibly 15 feet. The salts are generally found interbedded or mixed with mud or peaty material, and in very few instances are the deposits in a pure enough form to be commercially marketable in their raw state. The mud beds also contain numerous crystals of the alkali salts.

Type II.

Brine streams or springs occur in many places, and may carry sufficient salts in solution to warrant their commercial exploitation for medicinal and other purposes. In some of the occurrences of this nature the principle salt present is sodium chloride, the other salts being present only in small quantities. The brine springs of northern Manitoba are good examples of this class of deposit.

Composition.

The composition of the salts occurring in these basins consists chiefly of mixtures of sodium and magnesium sulphates in varying proportions with, generally, small quantities of sodium chloride and possibly other salts such as sodium carbonate, etc.

With these salts may be associated other soluble salts such as sodium carbonate, and in small quantities, the salts of the calcium, potassium and alum groups.

On account of the nature of the natural alkali deposits and brines of Western Canada, it will be necessary in nearly all cases to purify the raw product from such deposits, in order to produce marketable commodities. A pure Glauber's salt can be obtained by evaporating the brines or by dissolving the soluble salts already deposited and separating the sulphate of soda by differential crystallization. To produce salt cake from the hydrous salt it will be necessary to develop processes for eliminating the water of crystallization. Theoretically, this appears easy, but there are a number of practical difficulties in the way of development which have not yet been overcome.

Uses.

Sodium sulphate in the anhydrous form is more commonly known by its trade name, SALT CAKE. As salt cake, it finds its chief use in the manufacture of sulphate pulp; in metallurgical work in the refining of nickel; in the manufacture of window, plate and bottle glass; and in making water glass. In the hydrous form, it is marketed as Glauber's salts, and as such, is used in dyeing; in tanning; in the textile industry as a mordant; and in medicine.

Magnesium Sulphate or Epsom salts is largely used in the cotton trade for warp-sizing; it is also employed for medicinal and agricultural purposes, and in dyeing with aniline colors, since goods thus dyed are found to stand the action of soap better.

Sodium Chloride is the ordinary common salt of commerce, and as such, does not need further mention.

Market Situation.

Sodium Sulphate.—So far there has been no steady production of sodium sulphate from the alkali lakes of Western Canada. The Salts and Potash Company, Ltd., of Kitchener, Ont., operating at Muskiki Lake (Tp. 39, R. 16, W. 2nd), Sask., have erected refining plants at their lake and also at Kitchener, Ont., in which they have carried out considerable experimental work and hope shortly to be in a position to place the refined products regularly on the market. The salt cake so far used in the country has been obtained as a by-product from the manufacture of hydrochloric acid. The amount produced by this process in future will necessarily be governed by the market for hydrochloric acid. Glauber's salts are made from the anhydrous form by dissolving the salt cake and recrystallizing below 32.4° C.

Salt cake is manufactured in Canada by the following firms: Grasselli Chemical Co., Hamilton, Ont.; Nichols Chemical Co., Montreal, P.Q.—Plants: Sulphide, Ont., Capelton, P.Q.; Victoria Chemical Co., Victoria, B.C.

The Canadian production of salt cake and Glauber's salts as furnished by the Dominion Bureau of Statistics for 1918 and 1919 was as follows:

	1918.		1919.	
	Tons.	Value.	Tons.	Value.
Salt Cake	6,001	$133,544	3,197	$57,045
Glauber's Salts	2,358	60,281	1,423	45,731

*Prepared by Mr. Cole for the Mines Branch, Department of Mines, Ottawa.
Issued January, 1921.

Conservation of Fuel and By-Product Manufacture

At a recent meeting of the North Staffordshire (England) Mining Engineers' Institute, the President, Mr. J. R. L. Allott, gave an address on the "Conservation of Fuel and By-Product Manufacture," from which we quote in part, as follows:

It was a fact that in the space of three or four years India would completely cease to purchase iron and steel from the Mother Country. By that time her coal and iron deposits, her coke ovens and blast furnaces would be developed sufficiently to provide the whole of her requirements. What was true of India was equally true of South Africa. For many years huge quantities of coal had been exported to that Colony. It used to be the custom for steamships going between England and the Cape to bunker coal for the outward and return journeys at Southampton, but now the exact reverse was taking place, and coal was being bunkered in South Africa sufficient to carry the steamer both ways. The favorable natural facilities in South Africa, coupled with the abundance of cheaper labor, enabled coal to be raised at a figure comparable with what it cost in England ten years ago. It was common knowledge that only a few weeks ago a cargo of 100,000 tons of coal arrived in the Tyne from China at a less cost than it could be produced in this country, and that several European countries were giving a serious trial to Chinese coal. This menace to our trade would be best appreciated when we considered that China had a virgin and undeveloped coalfield extending to 232,000 square miles. Much of the coal in this vast area was anthracite, lying near the surface, whereas the coalfields of Great Britain had an area of only 12,000 square miles, with seams lying at great depth from the surface.

We had also recently heard of 32,000,000 tons of American coal being purchased for use in Scandinavia at a price less than we, who were so much nearer, could afford to supply it. All this leads inevitably to the conclusion that our markets were being jeopardized by foreign competitors, and it was extremely difficult to see how we could preserve our export trade in coal, iron, steel, and manufactured goods in the face of it. It was therefore necessary that we should take stock of our national position and seek to preserve it.

Conservation of Coal.

Continuing, the President remarked that there were three great factors which, in our efforts to conserve coal, would compel us to resort to its carbonization:—(1) There was the imperative demand for the products of carbonization: liquid fuel for ships, internal-combustion engines, etc.; ammonia for fertilizers; products for our chemical industries, etc. (2) There was the equally important demand for some kind of smokeless fuel to replace the coal used for household and industrial purposes. (3) There was the need for the more economical production of power for our mines and factories, and heat and light for our homes. As an illustration how important these factors were, and how deeply they affected the conservation of our fuel resources, he referred to the tremendous expansion of the motor trade, and the consequent increased demand for motor spirit. These demands could not now be met from foreign mineral oil resources. It would only be by increased production of benzol from coal that they could be satisfied. The expansion of the motor trade in other countries was progressing at an enormous rate, and in a very short time they would be able to consume all the petrol they produced. It had been stated that the number of motor-cars owned by the people of these islands was about one for every twenty families, whereas in the United States there were about 8,000,000 cars, or one for every second family. They were used very largely by industrial workers and farmers. But the wonderful progress of the motor industry in the United States could be repeated here if the necessary amount of motor spirit could be provided.

The quantity of benzol produced in this country was only some 25,000,000 gallons per annum, whereas many times this quantity could be consumed—at least 200,000,000 gallons if it were available. Having regard to the fact that petroleum spirit would in the future be much more difficult to obtain, and that the manufacture of alcohol for this purpose would take some years to develop, it was clear that every possible effort should be made by collieries to carbonize more coal, and thus help forward the natural development of the motor industry, as well as assist in rendering the country independent of foreign supplies.

Alcohol was looked upon as a new source of supply, but even this would come chiefly from coal—from the ethylene which was such an important constituent of coke-oven gas. Experiments on the extraction of alcohol from coke-oven gases at Skinningrove had recently proved conclusively that such processes were quite practicable. Nor should we forget the rapid strides made in the use of fuel oil by the great liners and battleships; this fuel saved cargo space, was more adaptable than coal in many ways, and was of greater thermal value. Whilst great efforts had been made—many under the supervision of their esteemed past President, Sir John Cadman—to procure natural oil in this and other countries, the success which those efforts had so far attained was not sufficient to guarantee a solution of this all-important oil fuel problem by such means.

It seemed clear that, just as our exports of coal and manufactures declined, just so should we need to provide more and more our food supplies at home. This was a matter which deeply concerned the mining industry, because such food supplies could only be increased by some system of intensive cultivation of land, and by the greater utilization of all kinds of fertilizers, the chief of these, as was well known, being sulphate of ammonia, which came principally from coal. As a result of the high price of fuel, many ammonia-recovery gas-producer plants had been closed down, thus reducing the amount of ammonium sulphate produced, and further accentuating the fertilizer problem. It might be thought that this reduction in output of ammonia was more than balanced by that produced synthetically, but whilst considerable quantities of ammonia might be produced in the future by such methods, they were hardly at present serious competitors. In any case, if such processes became general, the power

necessary for their working would in all probability be obtained from gas by the carbonization of coal.

Smokeless Fuel.

The second great factor affecting the progress of our industry was the demand for some kind of smokeless fuel to substitute the present wasteful method of burning coal in open grates. The demand for such a fuel was growing more and more insistent. From a hygienic point of view it was certainly very desirable, and because of the great need of conserving our coal it should have our best support. Having regard, however, to the unfortunate experiences of several undertakings formed with the object of manufacturing low-temperature fuel, it could not be said that a case had been made out for full development on these lines; but the failure had not been due to any insurmountable technical difficulties, and a time would come when a suitable smokeless fuel would be manufactured, accompanied by the fullest extraction of by-products.

In this connection it was of interest to note that an inquiry was to be held locally on the subject of smoke abatement. It was clear, therefore, for the reasons just enumerated, that there was to be a great expansion in the business of carbonizing coal, and this concerned the mining industry deeply, since the only proper place for such carbonization was in the vicinity of the collieries where the suitable coal was raised. He looked forward to the time when coking coal would only be used for the production of the essential substances—gas, coke, and by-products.

The expansion of the carbonizing industry would provide the necessary raw material in the shape of hydrocarbons for the intermediates, and sulphur for the sulphuric acid necessary to produce them, as well as the heat, energy, and power to work the plants. Where the carbonizing operations were on a sufficiently large scale, say 6,000 tons per week, he was strongly of opinion that many of the more important intermediate compounds of dye manufacture should be made on the colliery premises. At such works it would be a very proper undertaking to prepare from the oven gases—benzene, toluene, xylene, etc., and from these, by well-known and standardized processes, the nitro compounds of benzene and toluene, and also the reduced products of the latter—aniline and toluidine. For the manufacture of these valuable substances, in addition to the hydrocarbons themselves there would be required large quantities of sulphuric, nitric, and hydrochloric acids, as well as soda. For all the sulphuric acid required, and this is by far the most important requisite, the sulphur present in the sulphuretted hydrogen of the oven gases would be amply sufficient. Its abstraction presented no difficulties, except those of capital outlay, and it was only a matter of time before such processes were adopted. The raw materials for nitric acid manufacture had until recently had to be imported in the form of nitre from Chile. Their transport to the ovens, instead of to the chemical works centres, therefore entailed no extra cost.

Coke-Oven Gas for Lighting, Etc.

Attention should be drawn to the great economy in fuel which would be possible by the extension of the use of coke-oven gas for public lighting, heating, and power production, and to the possibility of greatly increasing the quantity of the useful products of coal carbonization thereby. By this means, it was believed that if the public could be supplied with a cheaper gas of constant composition and pressure, and of sufficient calorific value, there would follow a considerably increased consumption of gas for the production of heat, light, and power. Having regard to the increasing cost of coal, labor, and transport, it was difficult to see how such a cheap gas could be provided by the gas authorities without some drastic alteration in their methods of carbonization, which would involve large capital expenditure. A ready means of procuring such a cheap gas, however, was found in the gas obtained during the carbonization of coal at the coke ovens. This was at present used in heating up the coke ovens, any surplus gas or heat being used in gas engines for generating power, in boilers for steam raising, or, in some cases, wasted. In regard to some of these uses of coke-oven gas, it could not be said that they were altogether satisfactory. In most cases the gas used for steam raising was very uneconomically employed, often in unsatisfactory, unregulated burners, and frequently accompanied by three or four times the quantity of air required for its combustion; and as to that used in maintaining the heat of the ovens, it would probably be more economical to heat the ovens with producer gas, generated from coke or cheap fuel. It would be seen, therefore, that there was more than a possibility of not only a large quantity of surplus gas from coke ovens being rendered available for public supply purposes, but that in some cases, with certain modifications in plant and processes, the whole production of gas from the ovens might be available.

An extension in the use of coke-oven gas would therefore result in a great increase in the utilization of gas for domestic heating and industrial purposes, and would thus entail a corresponding reduction in the quantity of coal now used in open grates and in industrial processes. It would, at the same time, provide the chemical products which the country needed. That coke-oven gas was quite suitable in every way for the generation of heat, light, and power for the public service was now generally agreed. Recent legislation had made possible the supply of a gas of moderate calorific value, and without any illuminating standard, such as could easily be obtained from a modern coke oven.

It would be of interest to know that during the hearing of an application by an important city in this country to borrow money for gasworks extensions, the Board of Trade strongly favored the purchase of coke-oven gas, and seemed to indicate that wherever coke-oven gas was available they would insist upon its being used for town purposes, rather than sanction expenditure on new plant at gasworks.

Fuel at Collieries.

The cost of steam-raising had become a very serious item in the accounts of every one of our collieries, because of the enhanced value of the fuel, the increased cost of plant, and increased wages. Everything possible should therefore be done to bring about saving by taking advantage of every available means. If an evaporation of 5 lbs. of water per lb. of coal (and this was not an uncommon degree of efficiency) could be increased to 10 lbs. per lb. of coal by the pre-heating of feed water, by keeping boilers and their settings in good order, by insulating pipe work, and by judicious firing, a considerable saving would ensue. Such results were quite pos-

sible with modern appliances. Where coke-oven gas was being utilized for steam-raising, the possibilities of the latest gas-burning apparatus should be investigated.

Further saving could be effected by the manner in which steam was conveyed and used. Where long steam mains had to be employed the advantages of superheated steam should not be lost sight of. The employment of compound engines where possible, and the possibility of using the latent heat in exhaust steam, should be seriously considered when contemplating the installation of air-compressing and electric generating machinery.

Much had been heard of the Government scheme for large super power stations, whereby electric power was to be produced. Until the possibilities of power generation at established collieries and works were exhausted, such colossal expenditure should not be embarked upon. It would appear to be far better that such power should be more economically produced at our collieries by way of carbonization, or by the process of complete gasification of coal, which was now coming so much to the fore; for, by this means, not only would non-carbonizing coal be employed, but also there would be assured complete recovery of all the valuable by-products.

Enormous progress had been made in the carbonization of coal in their own district. It would be within the recollection of many now present how that not so many years ago there were large quantities of coal carbonized in wasteful beehive ovens, all the valuable ammonia, benzol, and tar being dispersed into the open air and lost to the community. Only some twelve years ago there were no fewer than 800 beehive ovens at work, from which the whole of the products were wasted. That could be contrasted with the present methods, whereby there were 420 by-products ovens at work, recovering for the beneficial use of the country the essential by-products.

Miners' Nystagmus.

At the annual dinner of the Institute, which was subsequently held, Dr. J. S. Haldane, F.R.S., who was among the guests, said he had come to the district to investigate, along with Dr. T. Lister Llewellyn, means of preventing that troublesome disease, miners' nystagmus, which afflicted so large a proportion of miners. It had been shown that the complaint was due to deficient lighting. It was very difficult to increase very much the amount of light which a safety lamp—electric or flame light—would give, but they could bring it nearer. Dr. Llewellyn and he were going to try the effects of putting the light on the miner's head, close up to his work.

OFFICIAL ANALYSTS FOR QUEBEC LIQUOR COMMISSION.

Milton Hersey Company, Ltd., industrial chemists, Montreal and Winnipeg; J. T. Donald and Company, chemical engineers, Montreal and Toronto; and Major (Dr.) Rivest, professor of chemistry, University de Montreal, have been appointed official analysts for the Quebec Liquor Commission to conduct analyses of the liquor dispensed by the Commission, under the new Government Control Act of that province. In our May issue only one of the above analysts was mentioned, the fact that two others were also appointed, or their names, not having been received at the time of going to press.

Chemical Society News

REPORT OF THE MEETING OF THE CANADIAN INSTITUTE OF CHEMISTRY, MINING BUILDING, UNIVERSITY OF TORONTO, MAY 13, 1921.

THE meeting opened at 10.30. A telegram was read from Prof. James Watson Bain, President of the Institute, expressing his great regret that he was unable to be present owing to quite unforeseen circumstances.

On motion of Mr. C. Heys and Prof. Evans, Prof. E. G. R. Ardagh was elected Chairman, and on motion of Mr. T. L. Crossley, and Mr. C. Heys, L. E. Westman was elected Secretary for the purpose of reporting the minutes of the meeting in the absence of Mr. H. J. Roast, Secretary of the Institute.

Prof. Ardagh then introduced Dr. A. Hunter, of the University of Toronto, who gave an address on the chemistry of the process of digestion. The speaker outlined the chemical constitution of the various food materials, showing the functions of the various organs of the body. He pointed out the work which had been done in the ultimate analysis of classes of food materials, pointing out comparisons between what was posible in the body and the laboratory. A systematic survey was made of the action of digestive ferments. A number of slides were shown illustrating the mechanism of the various organs.

The lecture was designed to give the chemist a most satisfactory and clear conception of digestive reactions, and as such, was very much appreciated. In the discussion which followed Prof. A. Neish asked for further information on the function of acids in the stomach and the value of definite H.ion concentration in the stomach. Dr. Hunter stated that there was an optimum hydrogen ion concentration for each enzyme, giving further details on this point. Prof. Harcourt introduced the question of the relative value of individual proteins.

In connection with general business, Mr. S. J. Cook asked for the opinions of members as to the advisability of making a survey of the salaries paid to chemists in Canada. He outlined a number of questions which might be submitted to chemists, some of which related to arrangements regarding patents and sources of professional income other than specific salary. Messrs. Ardagh, Heys, Acton and Westman took part in this discussion, and Mr. Cook stated that the question would be brought before the Council of the Institute. Prof. Harcourt moved a vote of thanks to the speaker.

Visitors and members then adjourned to Hart House for lunch.

The afternoon session opened at 2.30, the Chairman introducing Dr. A. Stansfield, Professor of Metallurgy at McGill University. Dr. Stansfield spoke on the general question of the electric smelting of iron ore. He dealt with this problem in its general phases, showing how the work to date had developed in Sweden, Canada and California. He introduced his remarks by pointing out that the electric smelting of iron ore was an entirely different operation from the melting of steel scrap, which became so important during the war. It was shown that only under very special conditions could the smelting of iron ore in an electric furnace compete with blast furnace operations.

In specific detail, various technical and economic points to be considered were brought up. Where coal was scarce

and charcoal fairly abundant along with electric power, certain types of ore could be handled, as had been accomplished in Swedish furnaces. By a reduction of the quantity of charcoal used, less carbon and phosphorus would be present in the pig iron. A number of slides were shown illustrating the development of different types of furnaces. Some of these were photographs of large scale operations in Sweden.

Some of the more recent problems in the reduction of ore and lines along which future work might be profitable were suggested. The speaker has just completed experiments of a scientific nature on the reduction of oxides and iron by carbon. These will be published by the Advisory Council for Scientific and Industrial Research. The question of the "Reducing Flame" was mentioned, and hints given that by making the operation in two steps where the iron ore was first reduced to iron sponge and then melted electrically, it would be possible to save one-third of the electric energy. In general, the question is one which should concern Canada in particular as our conditions appear to be suitable for such operations if they can be worked out on a commercial basis.

Following this lecture an opportunity was presented to visit the Liquid Air Plant of the Physics Department of the University. Some interesting experimental work is under way involving the liquefaction of hydrogen and helium. This unique opportunity was enjoyed by all. The processes used were seen and explained along with some of the mechanical difficulties and unexpected phenomena met with.

At 7.30 demonstrations of the operation of the new electric furnace installation of the Department of Electro Chemistry were give nunder the direction of Professor Burt-Gerrans and Mr. Kelleher. This installation consists of a 200 K.W. transformer stepping down from 2,200 volts to from 30 to 60 to 120 volts in three and six-volt steps respectively, together with complete equipment of electric furnace regulators and instruments, safety devices, and pyrometers of various kinds. Various small editions of commercial types are now to be found in this laboratory.

The operation of a Heroult steel furnace was illustrated and also a carbon resistance furnace for heat treatments of metals and thermal measurements of refractories. The characteristics of arcs between large electrodes were illustrated by projection of images on screens. The layout operation of a high power transformer for use in experimental work was demonstrated. The whole day was voted a most enjoyable presentation of chemical information and should result in further similar gatherings.

DR. MORDEN ADDRESSES QUEEN'S BRANCH.

The members of the Queen's University Branch, Canadian Institute of Chemistry, were addressed by Dr. G. W. Morden, of Picton, Ont., formerly of the British Cellulose Company. Dr. Morden spoke on the "Manufacture and Applications of Cellulose Acetate," and from the wide experience he had with the manufacture of this product during the war, he was able to deal with the subject in a way that brought valuable instruction to his audience. The address, as was the case when Dr. Morden addressed the Toronto Section, Society of Chemical Industry, on the same subject last December, proved most interesting as well as instructive.

PROGRAMME FOR ANNUAL MEETING OF SOCIETY OF CHEMICAL INDUSTRY IN CANADA.

Preliminary arrangements have been completed for this extensive programme. It is unlikely that more than minor changes will be made.

Most of the visitors from England will leave on the "Melita" from Liverpool, August 13th, arriving in Montreal on or about August 22nd. The programme at Montreal calls for receptions to visitors on 26th and 2th; commencing Sunday, August 28th, golf and motor trips around the city.

Monday, August 29th.

Morning—Ten o'clock: Council Meeting at McGill University.

11 o'clock: Annual Meeting. (a) Address of welcome. (b) Reply. (c) General business of the Society.

Afternoon—1 o'clock: Civic Reception and Lunch.

3 o'clock: Visit to McDonald Agricultural College; Supper and Garden Party.

Tuesday, August 30th.

Morning—11.30 o'clock: (a) Address by a prominent Canadian Chemist; (b) Pulp and Paper Symposium (3 papers).

Afternoon—1 o'clock: Luncheon at Windsor Hotel, given by Montreal Section.

3 o'clock: Visits to industrial plants.

Evening—Banquet at Windsor Hotel.

Wednesday, August 31st.

Morning—10 o'clock: Addresses and technical papers.

Afternoon—1 o'clock: Luncheon at Windsor Hotel.

3 o'clock: Special Convocation at McGill University.

4 o'clock: Trip down Lachine Rapids.

Evening—11.55 o'clock: Leave by night train for Shawinigan.

At Shawinigan, the paper and electro-chemical industries will be inspected. The special train will arrive in Ottawa on the morning of September 2nd, and the day spent visiting prominent public buildings and industries. The party will arrive in Toronto Saturday morning, September 3rd, and will be taken to University Residences and Hart House. It is expected that the morning will be spent in the city and visiting the Harbor Works. This will be followed by luncheon at the Canadian National Exhibition, where the speaker of the day will be one of the prominent visitors. The Exhibition authorities have arranged to call this "**Chemical Industries Day.**" The afternoon will be spent at the Exhibition, visiting the Chemical Section and places of industrial interest. This will be followed by a special Convocation at the University and a Dinner given by the Toronto Section. On Sunday, the party will go by boat to Niagara Falls, spending the day on the Canadian side. On Monday morning, power plants and hydro-electric power developments will be visited, followed by a Luncheon, attended by representatives of American Section of the Society, who will take over the party for a visit to plants on the American side, leaving that evening by special train for Syracuse. On Tuesday, September 6th, the Solvay Plant will be visited, the party leaving for Albany that night. After visiting plants of interest in the vicinity, including Schenectady, the party will move on to New York, via Hudson River boats.

From September 7th to September 10th, the party will co-operate in joint meetings of the American Chemical

Society and visit points of interest in the vicinity of New York and Long Island. The Chemical Exposition opens in New York on September 12th, and during that week further joint gatherings of Societies will be held, the party leaving New York for their return trip late in the week.

SHAWINIGAN FALLS SECTION, SOCIETY OF CHEMICAL INDUSTRY.

A dinner was held by the Shawinigan Falls Section of the Society of Chemical Industry at the Cascade Inn, Shawinigan Falls, on April 12th, and was attended by about forty members.

After the customary toast to the King, the Honorary Chairman, Dr. F. W. Skirrow, introduced the principal speaker of the evening, Mr. V. G. Bartram of the Canadian Electro Products Co.

Mr. Bartram gave a very interesting talk on the situation in Europe, drawing a comparison between the conditions in England, and the countries surrounding Germany during his first trip to Europe, March to June, 1920, when he visited, in addition to England, Holland, Belgium, France, Italy and Switzerland, as compared with conditions as he found them on his return to England again in September, 1920. During this latter visit and just prior to his return in February, 1921, to Canada, Mr. Bartram spent a month in Germany visiting most of the larger chemical centres and sizing up the situation and conditions under which the German industry was operating. Mr. Bartram stated that he was particularly struck by the difference in the commercial conditions in Germany, particularly as compared with England when he left there the first of January this year. There seemed to be absolutely no unemployment in Germany and most of the industries were working to full capacity, particularly those industries which were able to obtain their raw materials in Germany. In many other instances, where Germans had the plant and equipment, German enterprise had arranged to obtain raw materials through outside interests, and these plants were working to capacity, selling only their labor and equipment and charging to the owners of the material, so much per kilo, or yard, as the case might be, for fabricating the raw material sent them. All this tended to increase unemployment in other countries and give additional employment in Germany, and in view of the existing exchange conditions, unless steps were taken to control German industry and protect industry in England and surrounding countries, especially the countries of the Allies, it would be very difficult, in Mr. Bartram's opinion, to hope to compete with the German manufacturers for some considerable period.

Mr. Bartram touched on many different matters which had come under his notice through conversations with different people in Germany and one matter of particular interest was his reference to the extreme politeness shown by the German people, whether he met them in a business way, or whether they just happened to be utter strangers travelling in the same railway compartment.

The Germans, also, according to Mr. Bartram, were anxious to impress upon one the extent of their own wealth, as evidenced by the wild spending orgies which he witnessed in many of the larger cities. It would appear, and this statement was further backed by expressions of the same opinion from different Germans themselves, as if the German people in not knowing the exact steps which will be taken to collect the indemnity, are very anxious to dispose of such wealth as they have retained in Germany, to their own personal advantage, and in this way the aim of the average German who has money seems to be to get the most enjoyment out of it while he has it.

Mr. Bartram was of the opinion that by proper control of industry and increased taxation, the Germans could well afford to pay the indemnity demanded by the Allies, and he felt that at the present time Germany was in a really prosperous condition, although, naturally, her people are very short of many of the real necessities of life, but seemed reconciled to the getting along with a minimum of luxury and without many of the things we here consider necessities.

Due principally to the enormous inflation of money, which Mr. Bartram stated he understood to be approximately 3300 per cent. over the currency in circulation in 1913, a person travelling in Germany gathered the impression that the country is immensely rich as far as Germany itself is concerned within her own borders. This is undoubtedly the case, and from a superficial viewpoint it would appear as if there were only two classes in Germany today, those who are extremely rich and those who are extremely poor. The rapid inflation of money has been much greater than the proportionate increase in prices, and in this way many persons through having property to dispose of, have been made enormously wealthy with hardly any effort to make money on their own behalf.

Based on statements made by Mr. Bartram and further information he obtained on the general situation, it would appear that Germany can only hold her present advantages in many lines in which she is at present dominating the world's trade until such time as the German populace tire of living under the conditions existing there today. There is no doubt that the Germans realize they have been beaten, and many Germans feel that by sticking closely to work and doing everything possible to maintain production on economic basis, they are dealing a severe blow to the Allied interests, and in this way getting back some of their own to offset the victory won by the Allies. Mr. Bartram does not believe it possible that the German populace can long continue to live in their present state of existence, and he has no doubt but that the situation as regards trade will rapidly be forced by conditions, even beyond the control of German industry, to reach a level under which Germany will not enjoy for any too great a period the present advantages she is now working with.

These economic problems, in addition to the actions being adopted by other governments to take steps by additional duties, etc., to offset the advantages Germany now enjoys through exchange, should improve the situation as regards the rest of the world, particularly within the Empire, so that better times may be confidently looked forward to on this side.

Mr. Vinet of the Shawinigan Water & Power Co., followed with a few remarks descriptive of his trip into Germany with the Allied Army of Occupation in 1919.

F. E. DICKIE, Sec.-Treas.

TORONTO SECTION, SOCIETY OF CHEMICAL INDUSTRY.

The last meeting for session 1920-21 was held at Hart House, April 29th. The usual dinner preceded the meeting. Officers were elected for the coming year. Three new members of the Committee were appointed, under the sys-

tem where three retire each year. Mr. G. C. Benson, of the Canadian National Carbon Co., Ltd., and N. C. Klotz, of the Canadian Ammonia Co., Ltd., were elected members of the Committee, and Mr. A. E. Fair was elected to represent Associates.

Prof. J. T. Burt-Gerrans, of the Department of Chemistry, University of Toronto, then gave an illustrated address on the Manufacture and Testing of Automobile and Storage Batteries. Individual parts of batteries were exhibited and their manufacture and use while operating were detailed. A considerable amount of original work was given and data on the testing of battery materials. A synopsis of the lecture will appear in a later issue.

Following the address, a number of those present entered into the discussion. Mr. M. L. Davies occupied the chair.

MONTREAL SECTION, SOCIETY OF CHEMICAL INDUSTRY.

Mr. H. W. Matheson, M.Sc., F.C.I.C., has been elected chairman of the Montreal section of the Society of Chemical Industry for the term 1921-22. He is a graduate of Dalhousie University, vice-president of Canadian Electro Products Limited, and vice-president of Shawinigan Laboratories, Limited. It was under his direction that such satisfactory progress was made in the production of synthetic acetic acid from acetylene. His ability as a business executive will assure the Montreal section of an efficient leader during one of the most important periods in the history of the society in Canada. The new chairman will have the pleasant but arduous duty of guiding the section while they entertain the overseas visitors in August.

The annual meeting and dinner of the Montreal section was held on Friday, April 22nd, at the Queen's Hotel. Some forty members and guests were on hand for the dinner.

The chairman for the past session, Mr. C. Hazen, addressed those present, reviewing the work that had been carried on during the year. He paid tribute to the late Dr. Henri St. Georges, a member of the Montreal section who died quite suddenly since the previous meeting. The secretary, Mr. Geo. McIntyre, reported that the attendance at meetings had averaged between fifty-five and sixty. This, he thought, could be improved, and pointed out that the establishment of the Shawinigan section had reduced to a certain extent the number on the Montreal register. During the session twenty-seven new associates and four full members had been added to the list. Mr. J. B. Bell reported as chairman of the programme committee, and a vote of thanks was moved by Mr. F. E. Cornell to those who had contributed papers at the meetings.

It was proposed by Messrs. Wardleworth and Job that a sub-committee draft suitable rules for the section, as this was necessary under the new arrangement of direct connection with London. The proposers, along with Mr. McIntyre, were given this task.

Election for officers and committe for 1921-22 resulted as follows:—

Chairman—H. W. Matheson.

Treasurer—F. W. Horner.

Secretary—W P. Dickson.

Committee—G. D. McIntyre, J. B. Bell, W. B. Woodland, H. J. Roast, R. M. MacLean, with Mr. C. Hazen past-chairman.

The question of a Canadian president for the whole society was dealt with. Dr. R. F. Ruttan has been the unanimous choice of all the sections. His duties were already heavy and increasing, but following the attitude taken by the various sections, he had been prevailed upon to allow his name to go forward as the Canadian choice, and the chairman read a letter from him accepting the nomination, in which he stated his appreciaton of the high honor conferred upon him by the Canadian sections.

Following the main business of the meeting and remarks by Mr. Wardleworth and Mr. Collitt with regard to the convention in August, the chair was taken by Mr. Matheson and a musical programme carried through by members of the section. Those responsible for this enjoyable part of the evening were Messrs. Walker, Brook, Blackburn and Kerr.

CHEMISTS AND ELECTRO-CHEMISTS HOLD ANNUAL MEETINGS.

With an attendance of over 1,400, the 61st meeting of the American Chemical Society, held at Rochester, N.Y., during the week of April 25th, was a pronounced success. At the council meeting an invitation was received to hold the 1922 spring meeting at Birmingham, Alabama. Drs. Charles F. Chandler and William H. Nichols were elected to honorary membership. A proposal for a new section to be known as the Arkansas Section was adopted by the Council. Dr. Charles Baskerville, of New York, reported progress for the committee appointed to meet the American Mining Congress with regard to conservation of the mineral resources of the United States. The number of members of the Society at the end of 1920 was reported at 15,582. A favorable report was received from the committee appointed to co-operate with the U. S. Chemical Warfare Service and reports showed that this service was being conserved and held ready for emergencies. Dr. Herty reported encouraging progress in regard to the proposed Chemo-Medical Research Institute, formerly known as the Institute of Drug Research. At the general meeting, presided over by Frank H. Lovejoy, chairman of the Rochester section, several notable addresses were given. Mr. E. J. Miner, president of the Pfaudler Co., of Rochester, appealed strongly for the encouragement of research, and deplored the tendency frequently noted of late to discontinue research efforts because of hard times. Intelligent research, he declared, was not an expense, but rather an investment in insurance for the future. Senator James W. Wadsworth told the meeting of the difficulties experienced in getting Congress to appreciate the value of chemical industries. He himself had only lately recognized the dependence of industry upon chemistry. The committee on Military Affairs saw the value of the Chemical Warfare Service when they had it pointed out to them that 30 per cent. of the casualties in the late war were due to gas, and he believed it safe to say that Congress would not permit the Chemical Service to disappear. Congressman Nicholas Longworth addressed the meeting and described the efforts being made to protect the American chemical industry from foreign industries, more particularly German.

The meetings of the different Sections were most successful, several excellent papers being presented. The key-note of the whole meeting seemed to be the emphasizing of the necessity of real chemical scholarship in industry, as well as in academic life. A feature of the meeting were the industrial exhibits, chief among which were

those of the Pfaudler Co., Christian Becker, Inc., and the Will Corporation.

American Electro-Chemical Society.

One of the best meetings yet held by the American Electro-Chemical Society was that held at Atlantic City, April 21-23. It was the 39th General Meeting. The following officers were elected for the year: President, Acheson Smith; vice-presidents, Charles F. Burgess, C. G. Schluederberg and E. L. Crosby; managers, Carl Hering, J. V. N. Dorr, F. A. J. Fitzgerald; treasurer, P. G. Salmon; Secretary, Joseph W. Richards. The membership of the Society now stands at 2,300. The retiring president, Dr. W. S. Landis, delivered a splendid address entitled "Our Inventory," in which he surveyed the electro-chemical industry in the United States, showing that it represented an investment of over six hundred million dollars. He surveyed the industry under the heads of Location, Transportation, Water Power, Fuel, Raw Materials, and Labor. Three technical sessions were held, one on "Arc Welding and Electric Furnaces," "Electrolytic Products and Cells," and "Corrosion."

BOOK REVIEWS

"Dictionary of Applied Chemistry."

(Revised). By Sir Edward Thorpe. Volume 1, 1921. Longmans, Green & Co. 750 pp. Price, $20.00.

World wide conditions have delayed the appearance of a revised Dictionary, and created at the same time an increased necessity for a revision of the previous edition.

Volume 1, covering the alphabet from A to Calcium, is now ready, and it is announced that the material necessary to complete the set will make six volumes in all, or possibly seven.

In going over the previous edition, it is apparent from a comparison that many new articles have been added, and others dealt with at greater length. The processes of manufacturing, even those which have been used in a large way, have increased enormously, and the patent literature, when boiled down to the utmost, demands considerable attention. Naturally, extensive additions are being made to the subjects of technical importance, such as Sulphuric Acid, Nitric Acid, Chlorine, Alkali Manufacture, Synthetic Nitrogen Products, Explosives, Coloring Matters and Metallurgy, and in addition, fine chemicals and pharmaceutical products are receiving considerable revision.

Members of the chemical profession and manufacturers should hold in high regard those who, through their cooperation, make possible such a dictionary in the English language. We are not, as individuals, naturally inclined to spend the energy necessary for the creation of great statistical works; but recent production and some of the proposals now before publishers, indicate that the English language is not likely to remain behind any other as the medium for standard works of this nature. The results of such efforts become the backbone of our technical libraries, and as common carriers of information have their use right down the line, from the research worker at the head of his procession, to the technical student, who happens upon the series accidentally for the first time.

"BIBLIOTHECA CHEMICO-MATHEMATICA."

A catalogue of old and rare important works on mathematics, astronomy, physics and chemistry. Volumes 1 and 2. 963 pp. N. Sothern & Co., London. £3, 3s.

This work has been under way for some time. Plans for its production were begun in 1906. It is the first Historical Catalogue of Science published in any country, giving the current price for books now rare and little known to the modern worker. The catalogue does not claim to be complete, but it is certain that few great works are missing. Something of this kind has been urgently needed. Systematic abstracts of literature do not date back to the time when so many principles were established. In these books will be found recorded descriptions of the works of the Ancients ,the Arabs, Mediaeval, and after Reformation clergy, the Jesuits, and that army of men in Europe and America who completed their work during the last century and the first decade of the present.

There is something lacking in the balance of a scientist if he has not followed development beyond a hasty review of modern abstracts. In striving to attain the new, we create a false impression of our mental capacity if we do not occasionally measure it against some of those who generated ideas at a time when conditions were most unfavorable.

Imagine a mathematician capable of sitting in judgment on the works of Newton and others finding his daily bread by calculating the probable chances of winning in games, bets, etc., and occasionally calculating interest values for a limited circle of shopkeepers. Such a work has its place and allows librarians and collectors to know what remains of our written scientific past. Each work is numbered and the date of publication given. Names of authors and subjects are listed and both volumes contain many valuable and original photographs of devices, machines and historical personages of science.

"THE PHYSIOLOGY OF PROTEIN METABOLISM."

By E. P. Cathcart, M.D., D.Sc. Longman's Green & Co., London and New York. 170 pp. Price, $4.25, U.S.A.

This is a reprint with additions of an earlier monograph which came out in a most interesting Biochemical series edited by Plimmer and Hopkins.

Progress is being made at the old problems still unsolved and what was begun in Europe is being carried on with great vigor in the United States. The monograph has come to the assistance of book literature and while original sources and discussions must remain the basis, the monograph is able to give in a condensed way a balanced picture of progress.

There is some indication that we are going from physiological chemistry to chemical physiology. Bearing in mind the contributions to date from different sources, the material and references are arranged under the following heads:

1. Digestion and absorption of Protein.
2. Protein Regeneration.
3. Feeding Experiments with Abiuret Products.
4. Deaminization.
5. Influence of Food on Composition of Tissues.
6. Protein Requirements.

7. Theories of Protein Metabolism.
8. Starvation.
9. Work.
10. Influence of Carbohydrates and Fats on Protein Metabolism.

OVERSEAS AND FOREIGN INDUSTRIAL NEWS

(Special Correspondence to Canadian Chemistry and Metallurgy from our London representative.)

Strike conditions in England are having the worst possible effect on iron, steel, metal and chemical industries. Prices may harden to a certain extent but it is a false situation, benefiting importers less than manufacturers. The glass trade is becoming gradually worse. The optical glass business is permanently ruined without protection, and a pre-war situation is likely to again exist. The reheating of glass furnaces shut down for lack of coal is a long process.

Position of British Dyestuff Corporation.

Under a reorganization of British Dyestuffs Corporation Dr. Herbert Levinstein and Sir Joseph Turner retire as directors. The adverse influence of heavy stocks of German dyestuffs in England will have a marked effect on future business. A recovery in textile trades would soon right this situation. The Society of Dyers and Colorists propose to get out a new list of natural and artificial colors, which will include trade names of products of principal makers. The minimum estimated value of stock on hand of coal tar products of British Dyers Ltd., is £4,000,000.

Iron and Steel Industry.

Normally, 300,000 men are employed in the English iron and steel industry. There were 300 blast furnaces operating in August, 1920; 193 in February, 1921; 109 in March, and on April 12th last 30. The men employed in metal engineering and ship building industries represent 12 per cent. of total male population.

Belgian Conditions.

Belgian trade has reached a point where further expansion will be slower. They have about caught up with their development program. Steel manufacturers are combining to purchase and sell.

German, French and Spanish Potash.

Germany is certainly disappointed in her potash sales in the United States. The Potash Syndicate blame trade depression in America, and Germans blame the Syndicate to some extent because they held the price high in accord with American exchange. In any event, the result was a slump in production and a closing down of some shafts. The Federal Potash Council would not allow an advance on internal German price of 50 per cent., as agricultural interests refused to pay. France offers increased competition and are underbidding German offers, but as they do not supply sufficient as yet, their prices will be met in due time. German interests are watching Spanish potash developments with a view to securing control. These Spanish firms have shown high profits on their business.

Development of Italian Zinc Ores.

The manufacture of lithopone is being pushed at Brescia. Italy is the leading producer of zinc ores in Europe. The new industry is being exempted from taxation for five years.

New Uses of Aluminum.

A Swiss metallurgical firm, Guilini Aluminum Works, at Basle, have taken up a new process for the manufacture of a special aluminum. The process allows for the manufacture of aluminum screws, bolts, etc. This new process opens up a new field for aluminum products. One possibility is the manufacture of aluminum aero engines.

Swedish Oil Shale Industry.

The Swedish Government has decided to assist private enterprise in the matter of working up oil shales. Three companies started during the war, but without getting well established. The aim of the Government is to obtain an independent fuel and power supply. Peat, sulphite, alcohol and shale will be studied by joint efforts of government engineers.

Phosphate Sources.

In 1913 Tunis and Algeria exported 1,270,000 tons of phosphate amounting to about one-third of total world production. In 1920 this was down to 334,704 tons. Algeria has a source of phosphate about 350 miles inland known as Djebel-Onk, which is capable of producing any amount of 68 per cent. ore. This is easily mined and is being looked to as a source possible of great immediate development.

Potassium Chlorate in Japan.

Production of potassium chlorate in Japan increased to 13,294,721 pounds in 1917, but fell off to 6,500,000 pounds in 1920. This industry was started in 1910 and had a great war expansion. Many manufacturers have now shut down.

Chemical Industries in Western India.

The annual report of the director of industries of Bombay, 1919-1920, shows possibilities along certain chemical lines. A large amount of crude casein is produced. The hand-made paper industry might be developed. A natural epsom salt is being recovered from brines running to a high percentage. These brines, situated at Kharoghoda and Aden, contain some bromide but not sufficient to handle in itself. The wood distillation industries are handicapped by a lack of demand for anything but charcoal. This charcoal demand is rapidly growing. Alcohol from Java stops much possibility of a development in this direction.

Chinese Uses of China Wood Oil.

The Chinese use this oil as a preservative for river boats, waterproofing cloth, shoes, silk, in this way substituting it for rubber. Good grades of Chinese inks are made by the oil or husks from wood oil nuts.

Dutch Oil Legislation.

Under a bill before the Dutch Parliament, the district of Djambi, Sumatra, containing large petroleum fields, will be worked by a private company, the Batowan Petroleum Co., and the Government. The Government is to receive 70 per cent. of the profit.

Tasmanian Oil Shale.

The Southern Cross Co. are opening oil shale plants following the Government's decision to remit duties on the necessary machinery. Equipment capable of dealing with 350 tons per day is planned. The fuel oil is known to be good, and the shale available in large quantity. The equipment in use for some years will be scrapped.

Aluminum Sulphate in Australia.

A company known as Sulphates Proprietary, Limited, are manufacturing paper makers' alum from deposits of

bauxite in Gippsland, Victoria. Ore suitable for making aluminum is available in New South Wales.

THE ASPHALT INDUSTRY IN UNITED STATES.

The rapidity with which North America is turning to the dustless highway is shown in figures just compiled from reports to the United States Bureau of Mines, Washington, D.C., and the Asphalt Association, New York City, the latter being the national organization of American and Canadian asphalt producers. The figures show that during the past eight years, five million tons of asphalt and asphaltic materials have gone into American highways—a quantity sufficient for fifty thousand miles of roads and streets, or double the entire mileage of the Route Nationale, the main highway system of France. The asphaltic-treated highways in the United States, if connected in one great roadway sixteen feet wide, would twice circle the globe.

According to J. E. Pennybacker, secretary of the Asphalt Association, formerly chief road economist of the United States Bureau of Public Roads and the American Automobile Association, the asphalt industry is in a sound condition, despite the industrial depression, and is confronted with flattering prospects for the future. "Investigation shows," said Mr. Pennybacker, "that the price of asphalt during the years 1915 to 1920 increased only 65 per cent., while highway labor increased 150 per cent. and the price of other road-building materials rose from 90 to 150 per cent.

"Due to the business depression there has been a slackening of trade in the asphalt industry, in common with every other line. Especially has there been decreased demand for asphalt for roofing purposes, owing to the decreased activity in building construction. It is expected that enough oil will be produced to assure an adequate supply of asphalt for years to come."

Statistics compiled by the Asphalt Association show that in 1920 asphalt production in the United States increased 78,000 tons over 1919 and 172,181 tons over 1918. Last year 1,350,000 tons were produced for all purposes. The production in 1919 was 1,272,000 tons and that for 1918 was 1,177,819.

Statistics compiled by the Bureau of Mines show that the average monthly production in the United States in 1918 of asphalt from domestic oils was 50,664 tons; that in 1919 was 75,157 tons, and that in 1920, was 107,551 tons. The production for January of this year was 80,672 tons.

STATISTICS OF VINEGAR AND PICKLE INDUSTRY.

During 1919 there were 34 plants operating in Canada, sixteen of which were in Ontario, seven in Quebec, four in British Columbia and three in Manitoba. The Capital invested amounted to $3,487,223. The cost value at the works of all materials used was $2,122,324. Expenses of operating were: Wages, $659,663; fuel, $46,507; and other expenses, $579,557. The selling value of products at the works amounted to $4,267,568.

The cost value at works of certain items were: Sugar, 2,083,065 pounds at $211,046; vinegar, 424,241 gallons at $97,444; alcohol, 294,697 gallons at $247,887; malt products, $23,698; containers, $549,838. The estimated selling value at works of vinegar and cider produced was $1,183,537.

CHEMISTRY IN NEW FIELDS

The Biscuit Factory.

THERE seems to be few things more difficult than to persuade manufacturers that they need to co-operate with chemists. The profession in general is indebted perhaps more to those daring souls who have gone out from universities and sold their services in new ways than to those who remain within closed walls, advancing our knowledge without much care as to whether or not it is ever applied. However, comparisons along this line are foolish.

The manufacture of biscuits is an important industry employing a host of people. It has grown rapidly and along with all cereal industries has been subject to organization. These industries with notable exceptions do not call for the services of the professionally trained man. Manufacturers of machinery have supplied mechanical equipment. The business depends on creating a demand and taking business away from the housewife to the factory.

The machines which have displaced hand labor and made large scale production possible are (1) the dough mixer, making possible the mixing of dough in large batches; (2) the dough brake, which rolls the dough into sheets and repeats the familiar use of the bread board and rolling pin; (3) the cutting machine, which adds rapidity and accuracy to the formation of the individual biscuit; (4) the mechanical oven, making possible continuous baking under control. From 1850 to 1880 the basic principles of baking machinery were worked out, since then they have been perfected.

The chemist as such, had no part in this. He arrives at the stage when the average manufacturer is satisfied that he has reached a point where everything is standardized. His sales force is efficient. The executives buy and sell. In the manufacturing branch the "practical man" is in control. His experience is great, but his education relatively poor, and he is in general the least progressive element. He has been sold machinery of obvious merit, but he has never been sold a process or an idea which was not most concrete, easy to grasp and mechanical in operation. It has been only when the executive end of the business saw losses and competition, which they could not solve, that they have turned to the processes of manufacture. They saw that raw materials which they had always thought of as similar were slightly different in quality. New substances entered the field. Ideas of uniformity in raw materials and finished products became the doors through which the modern chemist entered this field. Right there a clash arose. The chemist knew nothing of this business and the bake shop boss resented the intrusion of the technical man. Time alone seems to smooth down this situation in general. A chemist here and there learns to co-operate with both his non-professional and non-technical superiors and inferiors. He is accepted and then other plants adopt him because they have seen their neighbor's success.

The Chemical Problems of Biscuit Business.

Flour.—In sponge work all the problems of bread manufacture come up. To arrange for a uniform strength of flour with a series of changing factors operating is no mean problem. A somewhat limited use of other cereals such as corn flour, corn starch, etc., has been made as a means of correcting troubles arising from straight wheat flour of different grades. Shortening constitutes one of the most costly ingredients of a biscuit. A variety of products are

presented by manufacturers under this head. A large amount of research is yet necessary to explain the action of these materials during the operation of baking. Is the reaction chemical, physical, or both, and to what extent?

Sugar.—Every grade of sugar is used. In nearly all mixing operations the sugar is creamed with the shortening; then the liquid is added, followed by the flour. This leaves much undissolved sugar in the finished biscuit. There is a relation between the hardness of the biscuit and the ratio of sugar to shortening. In this general sugar group comes molasses, syrups, honey and glucose The question of making a really good honey synthetically from sugar is a live one. Few invert preparations have the real flavor.

Leavens.—The carbon dioxide generators or baking powders have not been thoroughly developed. A more exhaustive study of the best conditions for chemical reaction and correct chemical proportions to reduce by-products is necessary.

Eggs.—Fresh, frozen and dried eggs are used. The important problem of the keeping quality of the biscuit would be solved if it could be determined whether or not the bacteria present in the raw eggs are active in the finished product.

The use of gelatine, chocolate, cheese, cocoa, nuts, spices and flavors all present problems worthy of real scientific work because of the magnitude of the industry.

In the manufacture of what are known as "hard sweets" the problem of checking or breaking comes up. Apparently perfect biscuits will split and crack within twenty-four hours, causing tremendous losses as they are unfit for shipment.

Studies in packing and wrapping.—The question of using inert gases in tins would be valuable study for the industry. Many of these questions have been attacked with some success, but the industry as a whole has not adopted or furthered the work to any great extent.

For the young technical man the path is through every part of the process as a manual worker. Two years spent in this way would develop the engineering faculties of the chemist to a point where he would be ready to begin. Then some experience in administrative work would be beneficial, and lastly the undertaking of scientific research based on his complete foundation of experience.—Abstracted from article by Julius Rohn, manufacturing superintendent of the National Biscuit Company, New York City, in **Chemical Age**, April, 1921.

METRIC STANDARDS BILL ENDORSED BY INDUSTRIAL LEADERS.

The Metric Standards Bill, now before the United States Congress is receiving the support of many well known leaders in industry, and the prospects never looked so bright for its passage. The bill, if carried, will establish the metric system of weights and measures in the United States by a liberal system, ten years being allowed for the transition period during which the old systems will be gradually discarded. Manufacturers may use whatever measures they desire in production, but commercial transactions are to be on the decimal basis. The following are what some industrial leaders say regarding the proposed change:—

Goodyear Tire & Rubber Co., through P. W. Litchfield, Vice-President: "We are heartily in favor of the international metric standard." (The Goodyear Co. now makes extensive use of the metric units and has decided to adopt them exclusively.)

Crane Co., well known in Canada as Crane, Limited, (59 branches; manufacturers of about 20,000 articles, steam specialties), through R. T. Crane, Jr., President: "We have for 10 or 12 years advocated the metric system, which we thoroughly believe in."

Ford Motor Co., through Henry Ford, President: "We heartily approve of any step toward the adoption of the metric system in our industries. It appears there is no better time than now."

United Light & Railway Co. (19 subsidiary operating companies), through R. Schaddelee, Vice-President: "This organization is very strongly in favor of the installation of the metric system just as soon as possible, and we will be glad to do anything within our power to accomplish this."

Simmons Co. (large manufacturers of iron and steel articles), through O. B. d'Aoust, Secretary: "We do not hesitate to give our endorsement for the adoption of these rational units."

Waltham Watch Co., through Canover Fitch, Vice-President: "The Waltham Watch Company adopted the metric system in 1868, about 12 years after the establishment of the Company, and has used it exclusively ever since. We have found it much better for our needs and have done everything we could to advance its adoption."

Hammond Lumber Co. (minimum capital, $10,000,000), through A. B. Hammond, President: "We favor the promotion of world trade and national efficiency through metric standardization of weights and measures."

NEW RUBBER SOURCES.

It is reported that raw rubber has been successfully produced from a species of cactus plant originally introduced into Southern California by Burbank and also from the wild Opuntia vulgaris. The Burbank cactus is easy to transplant, and thrives equally in poor soil and in dry climates. Opuntia vulgaris is frequently met with in the United States. After special treatment of the latex, both species of the plant are statel to have yielded a clear rubber, resembling in color the smoked sheet rubber of commerce, and possessing the physical properties of Guayule rubber, and being of good elasticity and durability after vulcanization.

UNIFORM COAL CONTRACT.

The Fuel Committee of the National Association of Purchasing Agents has drawn up a proposed uniform coal contract which expresses its idea of a fair contract to be used for the purchase and sale of coal. The form is submitted by the committee for the use of those whose requirements it will meet. The Administrative Council of the Fuel Committee is as follows: Chairman, E. H. Hawkins, E. I. du Pont de Nemours & Co., Wilmington, Del.; H. M. Michell, Rome Manufacturing Co., Rome, N.Y.; J. E. Stauffer, A. M. Byers Co., Pittsburgh, Pa.; R. H. Sedgwick, Standard Chemical Co., Toronto, Ont.; H. M. Cosgrove, J. H. Markham, Jr., Tulsa, Okla.; H. L. Ogden, Gas & Electric Improvement Co., Boston, Mass.

NOTES ON CERTAIN CHEMICALS OFFERED BY ENGLISH MANUFACTURERS.

Citric Acid.—Citric acid occurs in the juice and sap of many fruits and plants, and, to a smaller extent, in milk and wine.

It is prepared from the fruit juice of three species of citrus—lemon, bergamot and lime, lemons being the principal source. Concentrated lemon juice is chiefly imported from Sicily, bergamot juice from Messina, and lime juice from Montserrat and Dominica. The concentrated juices are dark-brown syrupy liquids, and are used as such by some calico printers instead of the solid citric acid Concentrated lemon juice usually has a specific gravity of 1.24 and contains approximately 64 oz. citric acid per gallon.

In the manufacture of citric acid from lemon juice a quantity of chalk is mixed with water and heated in a wooden vat provided with an agitator, and the lemon juice is then run into the chalk mixture. The calcium citrate formed is separated, washed with hot water, made into a cream with water and treated with diluted sulphuric acid to regenerate free citric acid which remains in solution. The solution is filtered, concentrated and allowed to crystallize. Pure citric acid is a white crystalline solid.

Citric acid is used chiefly as an ingredient for artificial fruit beverages, as a raw material for the manufacture of citrates for medicine, in the manufacture of effervescent health salts in dyeing and calico printing, etc.

The present price of citric acid is about 2s. 7d. per lb., but it is not improbable that prices will be higher during the season.

Sodium Sulphide.—Sodium sulphide is obtained by heating sodium sulphate (saltcake) with coke breeze on an open furnace.

The porous mass obtained is then dissolved in hot water and the solution concentrated and allowed to crystallize, when ordinary sodium sulphide (32 per cent.) crystals separate out. A more concentrated product is obtained by concentrating the solution until the temperature reaches about 160 deg., and then allowing it to solidify, when a product is obtained containing 62 per cent. of Na_2S, and is known as sodium sulphide concentrated.

Sodium sulphide is largely used in the tanning industry, in the manufacture of sulphur colors, and in the dyeing of these colors on textiles.

The price of Na_2S concentrated is approximately £28 per ton.

Sodium Thiosulphate or Hyposulphite.—The above compound is not to be confused with "Sodium Hydrosulphite."

Sodium Hyposulphite (the "Hypo." of photography) can be produced by various processes which depend on the absorption of oxygen by sulphides (e.g., alkali waste) occurring in waste products. The Hyposulphite formed during the oxidation is obtained by concentrating and crystalling the filtered solution. Sodium Hyposulphite is used in bleaching as an "antichlor," for removing the last traces of chlorine from the bleached fabrics.

It is used extensively in photography owing to its power of dissolving unchanged silver bromide, iodide, etc., from plates and prints which have been exposed to light. It is also used to a smaller extent for bleaching wool, straw, oils, ivory, etc., where strong reducing agents would destroy the substance being bleached. Hyposulphite is used in the dyeing and calico printing for the preparation of mordants. It is also used in the sugar industry as a preservative against fermentation.

Names and addresses of English manufacturers of the above can be obtained from the British Trade Commissioners, 260 Confederation Life Building, Toronto, and from the British Trade Commissioner at Montreal and Winnipeg.

BREAD AND CONFECTIONERY INDUSTRY IN CANADA.

The bread, biscuits, confectionery and ice cream business is one of Canada's important industries.

Following are some figures regarding the industry, covering the year 1919, computed by Dominion Bureau of Statistics:—

Materials Used.

The quantity and cost value of all materials delivered at the works during the year, including freight and duty, are presented in the table below:

Classes of Materials	Unit of measure.	Quantity.	Cost value.
Flour	bbl.	2,635,502	$28,859,586
Yeast	lb.	2,829,489	899,458
Salt	bbl.	46,773	166,370
Butter	lb.	1,272,192	667,561
Lard	lb.	10,899,170	3,129,580
Milk	gal.	1,999,984	592,732
Cream	gal.	839,445	1,208,032
Milk Powder	lb.	415,218	85,438
Eggs	doz.	2,052,483	991,518
Fruits, etc.	lb.	5,381,080	1,105,911
Extracts, essences, etc. (value only)		....	413,018
Glucose	lb.	16,599,565	1,491,503
Syrups	gal.	383,171	258,533
Chocolate	lb.	12,035,859	3,214,149
Cocoanut	lb.	1,472,517	399,653
Cocoa Butter	lb.	2,723,750	1,096,158
Sugar	lb.	75,384,044	8,635,988
Containers (value only)		....	2,453,936
All other miscellanous materials..		....	6,320,068
Total cost of materials			$61,989,255

Products.

The selling value of the different products of the industry at the factory was $104,868,699, of which amount bread to the value of $42,947,886 is the chief item, with confectionery not far behind at $31,613,274.

Distribution of 2,015 plants reporting, were: Alberta, 97; British Columbia, 140; Manitoba, 91; New Brunswick, 29; Nova Scotia, 53; Ontario, 902; Prince Edward Island, 9; Quebec, 811; Saskatchewan, 81; Yukon, 2.

CANADIAN SUGAR SUPPLIES.

Comparative sugar statistics have been reported by the Dominion Government as follows:—

For four weeks' period ending March 26th, 1921, the sugar industry stood as follows:

	Lbs.
1. Stock of raw sugar on hand at the beginning of period	137,999,858
2. Stock of raw sugar on hand at the same time 1920	24,833,705
3. Receipts of raw sugar during four weeks ending March 26th	31,359,858
4. Refined sugar on hand at March 5th, 1921	65,494,799
5. " " " " 1920	12,589,628
6. Refined granulated sugar manufactured during four weeks ending March 26th, 1921	49,003,401
7. Refined Yellow and Brown sugar during same period	8,292,533
8. Shipments of refined sugar during four weeks' period ending March 26th, 1921	63,301,475

COMPANY NOTES

DU PONT ISSUES 1920 STATEMENT.

Net earnings of $5,058,022 and sales of $93,983,291 are shown in the annual report for 1920 of E. I. du Pont de Nemours & Co. These figures compare with sales of $105,437,923 and net earnings of $11,620,953 in 1919. Earnings applicable to common stock were $10,749,807, of which $6,267,747 was paid in cash dividends. In addition, the undivided earnings accruing to the company through its stock holdings in subsidiary and other companies, aggregated approximately $13,000,000, making a total of $23,749,807, equivalent to approximately $37.50 per share of common stock.

The company's suspended government war contracts form a chapter of the report. There were thirty-seven of these claims, aggregating $26,375,692, on December 31, 1920; but, by reason of advances from the United States for purchases of materials in claims, the net cash due the company was only $2,013,410.

As to twenty-one of the claims, aggregating $23,075,327, agreements have been reached with auditors and the local army boards showing that there is due the company in cash $345,693. The remaining sixteen claims, aggregating $3,300,365, on which there is $1,658,716 cash due the company, are still in process of settlement.

EARNINGS OF MERCK & CO.

The report of Merck & Co., New York, for the year ended Dec. 31 last, shows net profits from operation after depreciation of $323,561; other income of $17,216; total income $340,777, deductions $66,908; net profits $273,869. The surplus account shows: Surplus, Jan. 1, 1920, $662,304; surplus adjustments $332,227; total $994,531; net profits for the year ended Dec. 31, last, $273,869; total $1,268,400; preferred dividends $280,000; surplus Dec. 31, 1920, $988,400.

LIGGETT'S INTERNATIONAL EARNINGS.

The first annual report of Liggett's International Limited (based on English and Canadian currency computed at $4 per pound sterling and 90 cents per Canadian dollar) shows net sales $32,335,909; gross profit, $12,686,338; operating expenses, $8,779,522; other income, $161,721 (which includes one quarterly dividend received on holdings of United Drug Co.'s First Pref. stock), is added, and depreciation, doubtful accounts and current taxes are deducted, leaving net profit $3,482,667.

The exceedingly heavy British taxes on income and profits for 1920, as well as all Canadian and United States taxes, totaling $1,401,388, have been subtracted from surplus. The balance of earnings is $2,081,279 for the period stated.

After paying interest, preference dividends on English companies for 9 months, first pref. dividends on Canadian companies for 12 months, also the quarterly dividend due on preferred stock of the parent company, and after deducting exchange loss on dividend remittances, the balance is $1,025,660.

The English subsidiaries are Boots Pure Drug Co., Ltd.; Boots Cash Chemists (Eastern); Boots Cash Chemists (Western); Boots Cash Chemists (Southern); Boots Cash Chemists (Lancashire); United Drug Co. (Great Britain).

The Canadian subsidiaries are United Drug Co., Ltd.; Louis K. Liggett Co., Ltd.; Allen & Cochrane, Ltd.; Gassby's, Ltd.

Liggett's International Limited now operates through its subsidiaries in Great Britain, 632 retail drug stores established as Boots Cash Chemists, and it has 1,144 exclusive agencies known as the Rexall Stores. In Canada it operates through subsidiaries 39 Liggett's Drug Stores and has 630 exclusive agencies, the Rexall Stores.

The combined sales are running at the rate of $45,000,000 per year.

INDUSTRIAL ITEMS.

Soy Products, Ltd.—This company was recently organized at Hamilton, Ontario, to manufacture a synthetic food product from soya bean. F. Tildesley will be chemist in charge of production. Buildings for manufacturing are in the course of erection.

The Dumart Packing Co., Ltd., of Kitchener, Ontario, are going ahead with the construction of their new $180,000 plant. W. H. Dumart is president. Construction work is in the hands of More Construction Co., Toronto.

The Superior Brick and Tile Co. of Fort William, Ontario, are putting in more modern equipment. They have increased their capital from $40,000 to $250,000. Office of Company at 426 Victoria Square, Fort William. G. R. Duncan, Manager.

The Joseph Stokes Rubber Co., of Welland, Ont., are completing their machinery equipment and expect to operate very shortly. They started up in Welland last year.

Engineers of the Cross Fertilizer Co. have arrived in Welland, Ont., to carry on construction work in the erection of their new Fertilizer factory. This company has a plant at Sydney, Nova Scotia.

The Pedlar People, Ltd., Oshawa, Ont., are now manufacturing "Steelcrate" by cold-drawn process.

Plant of Lignite Ulization Board.—Briquettes will soon be a product of the new Government plant at Bienfait, Saskatchewan. An experimental plant for carbonizing and briquetting is being erected. The raw lignite is crushed to one-eighth in mesh. It is then dried and passed to carbonizers where volatile matter is reduced to eight per cent. Coal tar pitch, the binder they are starting to use, will be added, and after agitation the product is run through briquetting machines and along a cooling belt to storage bins. R. A. Ross of Montreal, is chief engineer, and E. Stansfield, chemical engineer in charge. L. R. Thomson, Secretary, acting for Dominion Government.

Dominion Steel Products Co., of Brantford, Ont., are going to manufacture valves for Darling Valve and Manufacturing Co. of Williamsford, Pa. These high grade valves will be made available at a reduced price in Canada by this arrangement.

DULUTH INTERESTS BUY ATIKOKAN MINE.

Port Arthur.—Two months ago the Atikokan Iron Company's mine near Port Arthur, Ont., said to be one of the largest producers in the district, was disposed of to Duluth interests. The blast furnace has been sold to outside interests who, it is understood, will operate the furnace in connection with the mine. The plant was sold for $1,000,000; $200,000 to be paid within four years and the balance at the termination of the four year term.

CAPACITY OF OIL REFINERIES INCREASES.

A complete directory of petroleum oil refineries in the United States has just been issued by the United States Bureau of Mines. The report, compiled by H. F. Mason, petroleum economist, states that there are 415 completed refineries in the country as compared with 373 in 1920. In addition, 44 refineries are in process of construction. The present daily capacity of all refineries is 1,888,800 barrels of oil as against a daily capacity of 1,530,565 barrels in 1920. Texas, with 70 refineries, has the largest number of plants now in operation. Oklahoma has 68, Pennsylvania 51, and California has 39 operating refineries. The daily capacity of the Texas refineries now operating is 330,800 barrels; that of the California refineries is 312,700 barrels; of the Oklahoma refineries, 248,050 barrels; while New Jersey, with only seven refineries operating, has a daily capacity of 215,500 barrels. The report contains data regarding the capacity and type of each plant listed as well as information as to whether at present in operation. Copies of the report may be had by applying to the Director of the Bureau of Mines, Washington, D.C.

TRANSPORT ASBESTOS BY AEROPLANE PROPOSED.

It is proposed by the operators of the Judge asbestos claim, situated about 15 miles north-west of the Matachewan Gold Area, Northern Ontario, to transport the asbestos out by aeroplane to the railway. A trial will be made in getting out a carload shipment this way, and as the aeroplane will carry about 1,000 pounds, 60 round trips will be necessary. Many mining men will watch the proposed experiment with interest.

GOOD DEVELOPMENT BY CONSOLIDATED MINING COMPANY.

Mr. James J. Warren, President of the Consolidated Mining and Smelting Company of Canada, Limited, in the report submitted at the annual meeting in Montreal, points out that the precipitous fall in metal prices which took place early in the autumn, and continued over the end of the year, had a serious effect upon profits which in 1919 amounted to $1,011,212.68, but in 1920 were only $291,349.83. There have, however, been favorable developments in the mines during 1920 and the long program of expenditure in capital additions and extensions is practically finished. Since the beginning of the year wages have been cut about 12½ per cent., and some materials have fallen in price. A large ore body carrying high grade zinc and fair lead values, has been encountered in the eleventh level. Diamond drilling in the bottom level has cut the high grade lead ore body which was so profitable on the upper levels.

FOOD STANDARD REGULATIONS.

Maple Products, P. C. 1324, April 30, 1921.

Maple Butter, Maple Cream, Maple Wax, or any other term intended to imply a maple product of such consistence that it may be spread like butter, shall be entirely the product of maple sap and shall contain not more than fifteen (15) per cent. of water. The dry substances of the material as shown above shall meet the standards for maple sugar.

RODOLPHE BOUDREAU,
Clerk of the Privy Council,
Ottawa.

CATALOGUES AND REPORTS RECEIVED.

Merck's Report.—One of the nicest house organs published, and at the same time one of the oldest in point of number of years of publication, is that gotten out by Merck & Co., New York, called "Merck's Report." It is replete with splendid information of special value to pharmaceutical chemists as well as users of reagents. It is published quarterly, sent free upon application. A feature of the report is the market report showing current New York prices on chemicals and drugs.

Chemical, Oil and Metal Markets

The quotations below represent manufactures' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

CHEMICALS.

There is very little change in the General Chemical Market. The opening of the month was rather quiet, as buyers were waiting to see what the Budget would do.

There have been a few advances, these being particularly the season's goods, such as Citric Acid, 5c.; Epsom Salts, 25c.; Potassium Iodide, 20c.; Napthalene Flakes, 2c; Caustic Potash, ½c.; Sodium Sulphide, ½c.

The declines in the heavy and fine Chemicals were, Salammoniac, ½c.; Salt Cake, $2.00; Sulphur Chloride, 1c.; and Potassium Cyanide, 2c.

The Rubber trade is rapidly getting on its feet, the Woolen Mills are progressing, and there is a good undercurrent in the other trades. Business should be better from now on than it has been during the last few months. Prices seem to be settling around present prices, and conditions should approach something like normal before the fall.

Surplus stocks and holdings of re-sellers are now gradually being eliminated, and inquiries for future deliveries are much better. It is pleasing to note that British manufacturers are now prepared to give more credit, which should influence buyers to purchase British goods more than in the past.

Olive Oil.—Reports from Spain indicate that the olive oil market is depressed. It is reported that there are 200,000,000 kilos of olive oil available for export. Official estimates of the quantity of the oil left over from last year is placed at 13,400 tons of 2,240 pounds each. The total quantity now on hand is estimated at 2,100,000 tons. Efforts are being made to remove the embargo on shipments of olive oil and thus effect immediate exportation. The price of the oil at Madril varies from 22 to 28 pesetas per 15 kilos.

Palm Oil and Glycerine.—Despatches from Marseilles, France, state that the palm oil and glycerine markets are quiet, and prices are stationery. Following are Marseilles quotations: Palm oil, Lagos, 170 francs; palm oil, Congo, 130 francs; glycerine, by saponification, 395; glycerine, lye, 80%, 350 francs; glycerine, lye, 40%, 120 francs. The glycerine market in Toronto and Montreal is quiet, and while prices dropped a cent per lb. during the month, the market appears to be holding firm at present levels.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals.

Inorganic.

Alum, Ammonia, lump and ground	100 Lbs.	5.00— 5.50
Ammonium Bromide	Lb.	.. —.45½
Aluminium Sulphate, high grade, bags	100 Lbs.	.. — 4.00
Ammonia, Aqua 26	Lb.	.11— .12
Ammonium Carbonate	Lb.	.16— .20
Ammonium Chloride	Lb.	.15— .20
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .14
Barium Sulphate (Barytes)	Per Ton	30.00—35.00
Barium Chloride	Lb.	.05—.07½
Barium Nitrate	Lb.	.. — .20
Barium Sulphate, B.P.	Per Ton	100.00—110.00
Battery Acid, up to and including 1.400 sp. gr.	Cwt.	3.00— 3.50
Battery Acid, over 1.400, up to and including 1.835 sp. gr.	Cwt.	3.50— 4.00
Bleaching Powder, 35% drums	100 Lbs.	.05—.05½
Borax, crystals	Lb.	.. —.07¾
Boric Acid, powdered	Lb.	.. — .18
Calcium Carbide, car lots, f.o.b. works	Ton	.. —100.00
Calcium Carbide, ton lots, f.o.b. works	Ton	.. —105.00
Calcium Carbide, less than ton lots, f.o.b. works	Ton	.. —110.00
Caustic Soda, ground, drum	Cwt.	6.00— 6.35
Caustic Soda, solid, drum	Cwt.	5.00— 5.50
Calcium Chloride, fused	Per Ton	58.00—60.00
Camphor Monobromate	Lb.	.. — 3.00
Carbon Bisulphide, in drums	100 Lb.	.. — .10
Carbon tetrachloride, drums	Lb.	.18— .20
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	30.00—40.00
Cobalt Oxide, black	Lb.	.. — 3.30
Cobalt Oxide, grey	Lb.	.. — 3.60
Copperas (Iron Sulphate) crystals	Lb.	.. —.02¼
Copperas (Iron Sulphate) sugar	Lb.	.. —.02¼
Copper Sulphate (Blue Vitriol)	Lb.	.08—.08½
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 1.45
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fuller's Earth, car lots, f.o.b. Toronto	Ton	35.00—40.00
Ferric Chloride, crystals	Lb.	.13—.14½
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid, 60%	Lb.	.. — .30
Hydrofluoric Acid, 30%	Lb.	.. — .14
Hydrochloric Acid, carboys, 18	100 Lbs.	2.75— 3.00
Hydrogen Peroxide	Gal.	.. — 1.05
Iodine, crude	Lb.	.. — 4.75
Iodine, resublimed	Lb.	.. — 5.20
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lithopone	Lb.	.09½—.10½
Magnesite, calcined	Per Ton	.. —25.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.18— .20
Magnesium Sulphate	Lb.	.03½—.04½
Mag. Sulphate, B.P., Medicinal	Single Ton	70.00—75.00
Mag. Sulphate, Technical, car lots	Ton	55.00—60.00
Muriatic Acid, 18	100 Lb.	2.75— 3.00
Nitric Acid, 36 carboys	100 Lb.	.09—.09¼
Phosphoric Acid, 85%	Lb.	.43— .50
Phosphoric Acid, 50%	Lb.	.29— .31
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. —.32½
Potassium, Bromide, granular	Lb.	.. —.32¼
Potassium Bichromate	Lb.	.. — .35
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — ..
Potassium Ohlorate	Lb.	.. — .18
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash, 100 to 500-lb. lots		.. —.14½
Potassium Hydroxide (Caustic Potash), 25 to 100-lb. lots		.30— .35
Potassium Hydroxide (Caustic Potash)	Sticks	.. — .80
Potassium Iodide	Lb.	3.85— 3.95
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.65— .70
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Silver Nitrate	Lb.	.. —10.00
Soda Ash, bags	Lb.	.03—.03¼
Sodium Acetate, ton lots or over	Lb.	.. —.08¼
Sodium Acetate, lesser amounts	Lb.	.. — .15
Sodium Benzoate	Lb.	.80— .85
Sodium Bicarbonate, 100% pure	100 Lb.	3.85— 4.00
Sodium, Bichromate, bbls.	Lb.	.12— .14
Sodium Bisulphite, powder	Lb.	.. —.09¼
Sodium Bisulphite, 35	Lb.	.05½— .06
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.. — .28
Sodium Hyposulphite, kegs	100 Lb.	5.00— 5.75
Sodium Nitrate, refined	100 Lbs.	7.00— 8.00
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	.. — 2.25
	Per Cwt. in Car Lots	.. — 2.00
Sodium Sulphite	Lb.	.. — .07
Sodium Prussiate, Yellow	Lb.	.16— .20
Sulphur, ground	100 Lb.	2.75— 3.00
Sulphur, roll	100 Lb.	4 50— 4.75
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.50— 3.00
Sulphuric Acid, 66 Be, tank cars		.. —24.00
Talc, No. 1 grade	Ton	.. —30.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	..—18.00
Tin Chloride, crystals	Lb.	.40— .45
Tri-sodium Phosphate	Lb.	.. — .08
Ultramarine, Blue	Lb.	.20— .50
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting (English)	Ton	.. —40.00
Whiting (American)	Ton	.. —35.00
Whiting	Per Ton	35.00—40.00
Zinc Sulphate, com.	Lb.	.05¾—.06½
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.13— .15
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.. — .55
Acetic Acid, 28%, carload lots	Lb.	.. —.04½
Acetic Acid, 28%, 25 bbl. lots	Lh.	.. —.05¼
Acetic Acid, 28%, 15 bbl. lots	Lb.	.. —.05½
Acetic Acid, 28%, 10 bbl. lots	Lb.	.. —.05¾
Acetic Acid, 28%, 5 bbl. lots	Cwt.	.. — 5.85
Acetic Acid, 28%, 3 or 4 bbl. lots	Cwt.	.. — 5.90
Acetic Acid 28%, 1 or 2 bbl. lots	Lb.	.. — .06
Acetic Acid, 80%, carload lots	Lb.	.. — .12
Acetic Acid, 80%, 25 bbl. lots	Lb.	.. — .14
Acetic Acid, 80%, 15 bbl. lots	Lb.	.. — .15
Acetic Acid, 80%, 10 bbl. lots	Lb.	.. —.15½
Acetic Acid, 80%, 5 bbl. lots	Lb.	.. — .16
Acetic Acid, 80%, 3 or 4 bbl. lots	Lb.	.. —.16½
Acetic Acid, 80%, 1 or 2 bbl. lots	Lb.	.. — .17
Acetone, pure, drums or over	Lb.	.. —.19¼
Acetone, pure, lesser amounts	Lb.	.. — .25
Aspirin, in 100-lb. lots	Lb.	.90— 1.05
Alcohol, Absolute Ethyl, case of 1 doz 1-lb. bottle	1-lb. bottle	.. — 2.15
Alcohol, Absolute Ethyl, in steel drums of 10 gallons capacity	Imp. Gal.	.. —15.00
Alcohol, acetone, bbls. or over	Gal.	.. — 1.40
Alcohol, acetone, lesser amounts	Gal.	.. — 1.70
Alcohol, pure, bbl., 65% O.P.	Gal.	.. —10.50
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 1.15
Alcohol, wood, 95%, half bbl. lots	Gal.	.. — 1.25
Alcohol, wood, 95%, lesser amounts	Gal.	.. — 1.30
Alcohol, wood, 97%, bbls.	Gal.	.. — 1.78
Alcohol, wood, 97%, half bbl. lots.	Gal.	.. — 1.90
Alcohol, wood, 97%, lesser amounts	Gal.	.. — 2.05
Amyl acetate, technical	Gal.	4.75— 5.25
Amyl acetate, pure	Gal.	5.75— 6.25
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — .90
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 1.40
Carbolic Acid, white crystals	Lb.	.57— .75
Chloroform	Lb.	.. — .30
Citric Acid, domestic, crystals	Lb.	.. — .70
Coumarin	Lb.	.. — 6.00
Cream Tartar, 98%	Lb.	.38— .40
Dextrine	Lb.	.. —.08¼
Ether, Sulphuric	Lb.	.35— .50
Formaldehyde, bbls. or over	Lb.	.. — .25
Formaldehyde, 200-lb. kegs	Lb.	.. — .28
Formaldehyde, 100-lb. kegs	Lb.	.. — .29
Formaldehyde, 50-lb. kegs	Lb.	.. — .30
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Gallic Acid	Lb.	1.25— 1.75
Glycerine, C.P., single tin of 56 lbs.	Lb.	.. — .31
Glycerine, C.P., two or more tins	Lb.	.. — .29
Glycerine (pale straw) single tin 56 lbs.	Lb.	.. — .30
Glycerine (pale straw) two or more tins	Lb.	.. — .28
Hexamethylenetetramine		1.10— 1.50
Oxalic Acid	Lb.	.25— .30
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.50
Phenolphthalein	Lb.	.. — 1.80
Pyrogallic Acid	Lb.	3.00— 3.50
Quinine	Oz.	1.00— 1.10
Saccharin	Lb.	4.50— 5.00
Salicylic Acid	Lb.	.40— .45
Stearic Acid, Double Pressed	Lb.	.23— .27
Stearic Acid, Triple Pressed	Lb.	.26— .30
Tartaric Acid, crystals or powdered	Lb.	.40— .45
Tannic Acid, commercial	Lb.	.. — .50

Rubber.

The following quotations on rubber are in American funds, New York delivery:

Crude.

Para, upriver	Lb.	.. —.17¼
Caucho Ball, upriver	Lb.	.. — .12

Plantation Rubber.

1st Latex Crepe	Lb.	.. —.18¼
Smoked Sheet	Lb.	.. —.16½

Scrap Rubber.

Boots and shoes	Lb.	.04— .05
Automobile tires	Lb.	.. — .01
Steam and fire hose	Lb.	.. —.01½
Inner tubes, No. 1	Lb.	.. — .08
Inner tubes, No. 2	Lb.	.. —.05¾

Tanning and Dyeing Materials

Fustic Crystals	Lb.	.30— .35
Hematine Crystals	Lb.	.25— .28

Logwood Crystals	Lb.	.34— .36
Quercitron Liquid Extract	Lb.	.09— .10
Liquid Sumac Extract	Lb.	.07— .08
Ground Sumac	Ton	75.00—85.00
Chestnut Liquid Extract	Lb.	.3½— .04
Hemlock Liquid Extract	Lb.	.06— .07
Quebracho Liquid Extract	Lb.	.5½— .06
Quebracho Solid Extract	Lb.	.07—.07½
Liquid Blended Extract (Canadian)	Lb.	.4¾—.05¼

Metals.

Aluminium, No. 1, 98-99%	Lb.	.. — .29
Antimony	Lb.	.. —.08½
Brass, yellow ingots	Lb.	.. — .16
Brass, red	Lb.	.. — .18
Cobalt, metal	Lb.	.. — 3.50
Copper, electrolytic, small lots	Cwt.	.. —16.25
Copper, electrolytic, car lots	Cwt	.. —15.75
Copper, casting, small lots	Cwt.	.. —15.25
Copper, casting, car lots	Cwt.	.. —14.75
Gold, Pure	Oz.	23.00—25.00
Iron, Pig	Ton	.. —43.00
Lead, pig, small lots	Cwt.	.. — 6.15
Lead, pig, car lots	Cwt.	.. — 5.65
Magnesium, ribbon	Lb.	.. —18.00
Magnesium, powder	Lb.	3.00— 3.50
Mercury	Lb.	.. — 2.50
Nickel, shot or ingot	Lb.	.. — .40
Platinum, pure	Oz.	85.00—90.00
Silver, bar, American silver	Oz.	.. —.99¼
Silver, bar, Canadian produced, U.S. funds	Oz.	.. —.60¾
Steel, mild, ¼ inch, base price	Cwt.	.. — 5.75
Steel, mild, 3/16 inch, base price	Cwt.	.. — 6.25
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	8.15— 8.50
Tin	Lb.	.. — .36
Zinc, sheets	Lb.	.. — .25
Zinc (spelter) small lots	Cwt.	.. — 7.20
Zinc (spelter) car lots	Cwt.	.. — 6.70

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .36
Motor Gasoline (service stations)	Gal.	.. — .40
Lighting Gasoline	Gal.	.. — .46
Naphtha	Gal.	.. — .37
Coal Oil	Gal.	.. — .23
Fuel Oil	Gal.	.. —.08 1/5
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 1.50
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 3.25
Crude Creosote Oil, bbls.	Gal.	.. — .40
Refined Creosote Oil, bbls.	Gal.	.. — .55
Crude Coal Tar	Bbl.	.. — 9.20
Refined Coal Tar	Bbl.	.. —10.50
Coal Tar Pitch, bbls.	Cwt.	.. — 1.90
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52—. 57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .10
Naphthalin Balls	Lb.	.. — .11
Alpha-Naphthylamin	Lb.	.. — .51

Flotation Oils and Naval Stores.

Spirits of Turpentine, in bbl. lots..(Imp.)	Gal.	.. — .90
Rosin, Grade G, in 280 bbl. lots		.. —10.00
Rosin, Grade W.W., in 280 bbl. lots		.. —10.50

Gums and Vegetable Oils.

Vegetable Oils—		
Anise Oil	Lb.	2.10— 2.25
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .21
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .19
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.30— .32
Linseed Oil, raw, in bbl. lots ....(Imp.)	Gal.	.. — .65
Linseed Oil, boiled, in bbl. lots ...(Imp.)	Gal.	.. — .88
Monopole Oil	Lb.	.. — .30
Gums—		
Indian, No. 1A	Lb.	.. — .40
Indian, No. 1	Lb.	.. — .38
Tragacanth, No. 1, Ribbon	Lb.	.. — 4.50
Tragacanth, No. 1, Flake	Lb.	.. — 3.50
Tragacanth, Turkey	Lb.	.. — 3.75
Arabic, clear amber sorts	Lb.	.. — .18
Arabic, regular grain No. 4 and No. 6	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22¼
Arabic, white sorts	Lb.	.. — .40
Arabic, powdered, No. 1	Lb.	.. — .25
Arabic, powdered, No. 2	Lb.	.. — .24

Fertilizer Materials

Animal Tankage, per unit of Ammonia		7.00— 7.50
Animal Tankage, per unit of Bone Phosphate of lime		.. — .10
Nitrate of Soda	Ton	100.00—105.00
Muriate of Potash	Cwt.	7.00— 7.50
Pure Ground Blood, per unit of Ammonia		6.50— 7.00
Steamed Bone Meal	Per Ton	65.00—70.00

C. P. Chemicals.

Ammonia, C.P.	Lb.	.. — .26
Hydrochloric Acid, C.P.	Lb.	.. — .15
Nitric Acid, C.P.	Lb.	.. — .23
Sulphuric Acid, C.P.	Lb.	.. — .14

CANADIAN CHEMISTRY AND METALLURGY

Formerly "Canadian Chemical Journal."

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P. F. McCLEARY, Associate Editor. T. LINSEY CROSSLEY, Editor. L. E. WESTMAN, Business Manager.

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FROM THE PUBLISHERS

Silent Salesmanship

A salesman may call on a few people each day. The Chemical, Metallurgical and allied industries of Canada are separated by great distances. Often a salesman is forced to spend a whole day between calls. His call may not be timely, and indeed in this field he may not actually meet the chemist or superintendent who has most to say in the purchase.

Here is where "Canadian Chemistry and Metallurgy" becomes a vital factor in favor of the salesmen, whose firms recognize the value of continuous advertising. It is constantly on the job, preparing the way in an economical manner, helping salesmen in their work and often closing business they did not know about, by calling on the whole trade and all industries using chemicals and special machinery throughout the Dominion.

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EDITORIALS

THE SENATE AND RESEARCH

IN a recent issue we congratulated ourselves and Canada with undue haste. Parliament actually supported the Research Bill and the expenditures necessary to operation, but alas the Senate had the last word and blocked the scheme.

Just why these honourable gentlemen should do so is not quite clear. We rather think that it is because they met with success in business and public life at a time and by methods which are not so certain now. They are not young men and their average wealth is considerable. Sitting in the red chamber in which they gather, one is not seriously impressed with the idea that there is very much left undone that ought to be done, or that there is anything crude and undeveloped in Canada. The environment is not designed to stimulate such a thought germ.

With all due regard to these ancient and honourable brakes on legislation we are inclined to believe that parliament in this instance knew much better than the Senate what was needed in Canada in this regard. While there may be some disagreement about the method of procedure and the type of people to be entrusted with the work, there is no doubt about the necessity. Why should the hair of the northern musk ox be sent to England for a study of its industrial value? Who will reap the greater benefit from this study? This is the most unusual case we know of by any of illustrating the point that we must develop ourselves in the process of developing our resources or we will remain laborers and carriers to the rest of the world.

In a general way the Senate typifies those men of vision who saw in our obvious and easily obtainable resources an opportunity to develop large organizations. Their day is not to last, nor their methods to succeed always. Their vision and determination we still require, but the means to the end must be modified. The action of the Senate only delays an inevitable movement which may actually be urged more strongly now because of their veto.

The Manufacturers' Association meeting recently in Quebec were not slow to express their ideas on the subject. A strong resolution was sent of the Government, commenting unfavorably on the action of the Senate and asking that the matter be again taken up. This is a very hopeful indication that in due time Canadian manufacturers will be willing to support financially not only a scheme for general research but a more complete application of research principles to their individual plants. Once again we express the hope that manufacturers all down the line will get closer in touch with the scientific brain power of the country.

CHEMISTS AND CHEMICAL WARFARE

SIR WILLIAM POPE has recently prepared a stated case defending chemical warfare. His views are doubtless those accepted generally by chemists and his remarks are made in such a clear, logical and forceful way that we are giving them in full elsewhere.

In the course of his statement he finds occasion to take to task the medical profession, developing their function in warfare from a new angle.

Chemical warfare involves a new knowledge not possessed by previous generations of army professionals and utterly contrary to former popular conceptions. It is a new game and naturally champions of other sports do not wish it to replace their path to power. Chemical warfare presents opportunities for chemists, much to the disgust of the average military mind, which resents anything new.

It is more than likely that we have already gone too far with chemical warfare to ever turn back. It would be as easy to get nations to agree to fight only with bows and arrows, as it would to have them give up aeroplanes and gas. Quite aside from means designed to stop war, as long as preparedness is considered a factor in the life of a nation, the possibilities of chemical warfare will be with us and no doubt will be taken up by chemists of various countries under the official direction of their governments.

It is probably beyond the conception of the Canadian Department of Militia and Defence, that they should do anything along this line, or have much knowledge of what is being done. One cannot conceive of men walking through the streets on a fine Sunday morning carrying assorted varieties of laboratory equipment and calling for many cheers.

Sir William treats the whole question, particularly the portion relating to the "cruelty" of gas in a most effective manner. If different people could recognize that war was a ridiculous rather than a heroic outburst, movements toward peace would be assisted. The Chemist and the medical expert have the power in their hands even now and if we learn to laugh at modern methods before our poets and song writers immortalize them we may be saved much future turmoil.

STATISTICS

FEW people have any adequate conception of the potential value of accumulated observations by well-trained persons. For this reason, many industries to whom an extra three or four thousand dollars a year would make very little difference, do not employ chemists or engineers in such a way that they can give sufficient time to the proper observing and filing of daily conditions.

Here's a biscuit or candy factory, for instance, putting up material in almost air-tight containers on a humid day in June. Complaints of deterioration or softness are received in October. It would be very useful if the office had access to a proper report of atmospheric conditions on the date of packing. More satisfactory, though, would it be, if from careful and continued observations, well taken and recorded, the packing conditions could be so regulated as to prevent such occurrences.

These observations with the instruments now available can be made by "any intelligent person," but it has been our experience that when left as an extra duty to be done by "any intelligent person," that person has used his intelligence to decide that such tests need not be made when such person is busy or tired or anxious to get home.

The idea of physical ability being the qualification for certain duties was the weak point in the recent civil service classification. Servants were to be paid solely for what they did, and not for their appreciation of the significance of what they did.

Canada is taking its census. Thirteen thousand enumerators will do the plowing and harrowing—especially the latter. They will call perspiring housewives from their kitchens at the peak of ante-dinner activities, for important statistical contributions to the national archives. A census is a national stocktaking and more. We need all the facts of our national life, even if that wag did say, "There are white lies, and lies, and thundering big lies and statistics."

THE REPLY COURTEOUS

UNDER the head of "Surprising News," **Chemical Age**, London, comments, in the issue of June 4th, on the nomination of Prof. R. F. Rutton, as the next President of the Society of Chemical Industry. They need have no fear that the Society is making any mistake in this appointment. The qualifications of Dr. Ruttan, while they may be unknown to writers in **Chemical Age**, are indeed quite sufficient, and in many ways exceptional. He is at the top in every sense both as a professional man and as an industrialist through his Government advisory connections.

A consideration of the interests of the Society from the English standpoint alone, is a most unfortunate attitude to take. A quite high percentage of the members are Americans, and there are five sections of the Society in Canada. The holding of an annual meeting here is but the rightful recognition of the Empire and International importance of the Society. On such occasions the president elect is usually non-resident in England.

Considerable criticism might well be directed at the general tone of this editorial. No doubt, the Society will feel deeply grateful for the recommendations of **Chemical Age** in regard to its Annual Meeting. To presume, however, that the Society is to suffer neglect and a wasted year, because a Canadian or a non-resident of England has been chosen President, is anticipating bridges well in advance.

As a general rule, a known lack of facts keeps the scientific mind from undue and hopeless speculations, and a sense of good taste does not allow one to mention at the same time material equivalent to personal comparisons in cases where the same is quite out of order or premature.

The individuals concerned can only be amazed at the colossal ignorance and bad form of an editorial staff presumably capable of world vision.

The only redeeming feature of this obvious editorial "break" is the fact that **Chemical Age** is young, and in no way represents any official body of chemical opinion in England. In a broad way, it is just such a mental attitude on the part of certain types of minds that makes it so very difficult for those who have a little wider viewpoint to keep larger issues and developments to the front.

NEW YORK CHEMICAL EXPOSITION, Sept. 1921

ANNOUNCEMENTS from the headquarters of the National Exposition of Chemical Industries of the United States indicate that the Seventh Exposition is going to maintain the standard previously set. More than four hundred separate exhibits will occupy the main floor of the Eighth Coast Artillery Armory. This building offers a floor space equal to five city blocks, and besides giving plenty of space for exhibits, allows ample room for capacity crowds who wish to see the Industrial pictures and attend the symposiums.

The Exposition will open on September 1st, which is one week earlier than usual. This is being done so that the larger number of chemists attending meetings of the American Chemical Society and Society of Chemical Industry and other technical organizations during the week previous may be able to stay over for the exposition. More noted chemists and business men are expected to attend this year than ever before.

Representatives from various nations are arranging to be present and in particular a large party from England. Those attending the Annual Meeting of the Society of Chemical Industry in Montreal will finish their American trip in New York at that time.

The international character of the event will be more in evidence than before. The Canadian Government will be represented through various departments with important exhibits, and it is expected that many Canadian Chemists will arrange to be present during some of the stirring chemical events of the week previous and the Exposition.

The magnitude of the development of American Chemical Industries is a guarantee that this and future expositions will become regular occasions for large gatherings of chemical business and professional interests.

Fred W. Payne and Charles F. Roth are co-managers of the Exposition with offices at 342 Madison Ave., New York.

EMERSON B. BIGGAR

THE late E. B. Biggar, founder of The Canadian Chemical Journal, industrial writer and author, died at Toronto on May 31st at the age of sixty-seven years. He was without doubt one of the chief creators of technical and industrial trade journals in Canada. A more extensive account of his various activities and contributions to Canadian developments is given elsewhere in this issue. What he accomplished in pioneer work will place his name on the pages of historical records when many who have followed where he left off, are forgotten. Although he was better known perhaps elsewhere than among chemists, this outstanding fact should be remembered by them; that a man whose knowledge of chemistry in a professional sense was extremely limited, should single handed by his own personal work have given Canada and Canadian Chemists their first paper of any kind.

His connection with every paper he established was of the very closest nature. His satisfaction was not derived from guiding the financial interests or the general policy only, but rather from the joys and labors of creation in industrial fields where he thought there was scope and need for independent trade and technical literature.

BRITISH CHEMICAL MACHINERY

THE British Chemical Plant Manufacturers' Association has recently been reorganized. They are co-operating with the British Chemical Manufacturers' Association.

Those who viewed the chemical plants in Germany, along with the Mission to occupied regions, came back with a few new ideas along lines designed to strengthen their position in England.

Some nineteen firms are now united in a common effort to study the requirements of British Chemical industries. One of the first questions to be considered will be standardisation. Germany has reached an advanced stage in this regard. Among questions they are considering are the larger use of nickel and 12 percent. chromium steel.

The making of British chemicals, entirely by British equipment, is the worthy aim of these united associations.

ENGLISH AS SHE IS SPOKEN

THE following gem of diction is from the proceedings of the Parliamentary Committee on Fuel Supply:—

"In the main it is correct, but it is not scientifically correct. My talk might be criticised, part of this, in the analysis of coal. In analysing coal, called proximate analysis, coal is generally analysed for moisture, volatile combustion, fixed carbon and ash. Now the moisture in this coal is not the moisture that would appear in a piece of coal, but it is contained in the coal. This moisture is driven off your coal in your analysis at practically boiling water. Volatile combustibles comprise various constituents. Your fixed carbon is the remaining carbon contained in the ash. Following that we know that the general accepted classifications of coal in the lowest form is lignite, next bituminous, and next, generally speaking, is an anthracite. The classification of coal is a very difficult subject and everybody who knows anything about classification of coal has a different idea from another man but generally speaking between lignite and bituminous the distinction is in the moisture content of your coal."

The speaker is a University Professor. Let us hope the stenographer was sleepy.

Canada's Industries.—From one of the Westmount schools:

Question: What are the principal occupations in Canada?

Answer: Mining, lumbering and **aggravating.**

Is it a sign of better public relations with chemistry that the word "reaction" has become so generally used by reporters and salesmen?

Census Enumerator: "Chemical Engineer, what's that? What does he DO?"

It is related that a diplomatic but truthful man, when faced with the need of commenting on a friend's unattractive baby, saved the situation by exclaiming, "Well, that is a baby," With research in mind, we can say, "Well that is a Senate."

CORRESPONDENCE

A Discussion on Coal Resources.

Gardenvale, Quebec,

June 10th, 1921.

The Editor, "Canadian Chemistry and Metallurgy":

Sir,—In your issue of June, Mr. Louis Simpson contributes an article which is largely a criticism of my paper on "Canada's Coal Problem," presented at the annual meeting of the Canadian Institute of Mining and Metallurgy in Montreal last March.

At this meeting, in evidence before the Fuel Committee at Ottawa, and in the article in your June issue referred to, Mr. Simpson attacked my presentation of the coal-supply question because it contained no mention of fuel oil and hydro-electric power. As my paper dealt with **coal only**, Mr. Simpson's comment is not relevant, particularly as in two previous papers, of which the paper read at Montreal was plainly stated to be a continuation, I stated that Canada's fuel supply required, in addition to amplification of coal production, the fullest possible utilization of peat, water power and oil shales.

Mr. Simpson objects to my quotations from Prof. H. Stanley Jevons, who, Mr. Simpson is informed, "died years ago"; and from Edwin C. Eckel's book on "Coal, Iron and War," recently published.

Prof. Jevons is not dead, but he is the distinguished son of a distinguished father—with whom he has probably been confounded by Mr. Simpson—whose classical contributions to coal economics and the study of commodity indices have been referred to, and continued in the work on the "British Coal Trade," published in 1915, from which my quotation was taken.

With regard to Mr. Eckel, his book on "Coal, Iron and War," published in 1920, is remarkable from the viewpoint of Canadian readers, because it discloses by its numerous references to Canada, the possession of an unusually comprehending and sympathetic knowledge of Canada, and of the country's coming importance as a producer of bituminous coal. Mr. Eckel is a foremost authority on iron-ore resources, having been employed to value properties in Canada, and his knowledge of the country is based on first-hand examination of our mineral deposits.

Your correspondent is entirely incorrect in all his references to these two gentlemen.

Mr. Simpson states, in contravention to a viewpoint I am supposed to hold, that it "is imperative the fuel requirements of Eastern Canada shall, at all times, be considered separately from those of Western Canada. This remark, coupled with others, rather indicates that your contributor has not read my paper, as it emphasized this point above all others. The two quotations which give Mr. Simpson umbrage were used by me to illustrate the coming industrial importance of the West as the repository of 99.3 per cent. of our coal resources.

Your contributor also intimates that there exists in certain quarters a painfully evident desire to force the use of Canadian coal in locations where such use would not be economic, and makes particular mention of Ontario in this connection. May I point out that in my paper Ontario is referred to, so far as the supply of bituminous coal from Canadian sources is concerned, as "an apparently unfillable gap."

Mr. Simpson asserts that in some countries the use of hydro-carbon oil and of hydro-electric power is of more economic importance than is that of the use of coal. He also told the Fuel Committee at Ottawa that "a country possessing a sufficiency of well-distributed, cheaply-developable hydro-electric power, especially if this is supplemented by a home supply of hydro-carbon oil, obtained either from oil wells or the reduction of oil-yielding shales, can do without coal." "Under the conditions stated," reads his evidence, "coal is not necessary."

There is no part of Canada where the necessity for coal, under present conditions of civilized life, could be entirely obviated, even did the hydro-electric power sources and sources of fuel oil exist in the available quantity presumed by your contributor as ideal. Unfortunately they do not so exist. Neither has the entire substitution of electricity and oil for coal in industry and domestic heating been commercially solved With regard to oil-shale distillation the most recent and most authoritative article on this question is one in the "California Oil World," by Martin J. Gavin, Oil Shale Technologist of the United States Bureau of Mines, who states that no successful commercial process has yet been devised in America.

Mr. Simpson suggests that my presentation of the coal-supply question may misinform the public, but in writing his article for your paper he did not mention my name so that your readers could refer to the original paper for confirmation of the numerous quotations he makes from it, or for inspection of the context. Such a procedure, by any reader, would immediately have revealed the quite irrelevant nature of his criticism.

Yours truly,

F. W. GRAY.

June 17, 1921.

Editor, Canadian Chemistry and Metallurgy:

Sir,—As I am writing this letter from the field I have not at hand the references necessary to enable me to make the reply I would otherwise have done.

Mr. Gray's objections to certain criticism, made by me in the article he has reviewed, in no degree invalidate my arguments. Prof. Jevons may still be alive. The Professor may have published, not one, but a dozen, books, in 1915, yet the quotations used by Mr. Gray may have been badly selected and may be absolutely incorrect, as representing conditions in Canada in the year 1921.

Again, Mr. Eckel may be "A foremost authority on iron ore resources"; he may have been employed to value properties in Canada; but I have yet to learn that Mr. Eckel, who specializes in metallurgical questions, has an intimate knowledge of the industrial, economical or political situation as it is in Canada to-day.

I am not, however, now criticizing Prof. Jevons or Mr. Eckel, but Mr. Gray, and Mr. Gray's attitude to the most important question Canada has to face to-day, viz., "Canada's Future Supply of Light, Heat and Power." Mr. Gray has for a long time been recognized as being a special pleader for the coal operators; it is whispered he is to be given his reward. Let me remind Mr. Gray that "blessed is he who expecteth nothing, for he shall not be disappointed."

This question, however, is of too great an importance to Canada to be left in the hands of special pleaders, even and although they be at present editors of the Canadian

Mining Journal. Less than anyone, should a man holding such an honorable position permit himself to become a special pleader for Big Interests. He should only allow himself to be a special pleader for Canada. In my small way, I have endeavored to place before Canadian citizens the important question of Canada's Supply of Light, Heat and Power in a broad manner, giving to every possible practical sources of supply fair consideration. I have pleaded for a wide consideration of this national question, and, when opportunity offered, I have endeavored to consider, and speak and write upon the question.

Mr. Gray refers to my evidence, given before a Committee of the House of Commons, appointed chiefly to investigate the question of the future supply of Fuel for the Province of Ontario. The coal operators and their henchmen have objected to this testimony; but I have been the recipient of many compliments from men whose opinion was valuable, because, being lawyers, they understood the value of evidence. In my evidence, I indicated how the future immediate cost of Nova Scotia coal could be reduced, without injury to the operators or to the miners; but to the great benefit of the citizens of Canada. Such evidence does not seem to please Mr. Gray, who prefers to make objection to my statement that a country, well supplied with hydro-electric power and hydrocarbon oils, could do without coal. This, I again assert. Mr. Gray's reference to California is altogether beside the mark. Although supplied with some hydro-electric power and with oil, there are other factors which determine the possibility of establishing industries, besides that of Light, Heat and Power, even and although few, if any, industries can be, to-day, profitably carried on without Light, Heat and Power.

Mr. Gray states "There is no part of Canada where the necessity of coal, under present conditions of civilized life, could be entirely obviated." I give Mr. Gray a straight denial. There are. Moreover, as to Mr. Gray's statement that the necessary sources for hydro-electric power and fuel oil do not exist, I have only to say that Mr. Gray knows not of what he is talking. Had he said the sources were not at present available, he then would be correct; but I will counter and state that Mr. Gray, and those he represents, have been, and are doing their best to prevent their being made available.

These sources of Light, Heat and Power would have been made available long ago had the Governments of Canada made their development possible by allowing the free admission into Canada of the machinery, etc., required.

In conclusion, I would refer to a certain personal insinuation made by Mr. Gray at the end of his letter. I am quite unaware that Mr. Gray's name carried with it any special value. It is news to me if his record or his position warrants him to assume that any article written by him is of more value than the actual contents warrant. My reason for not mentioning Mr. Gray's name was that my criticism was not made against Mr. Gray himself, but against the matter contained in his article. I hope that I am not so small that I cannot separate a man from his opinion. I regret that Mr. Gray cannot appreciate my delicacy of feeling. "Honi soit qui mal y pense."

Yours truly,

LOUIS SIMPSON.

Georgio Terni, S.A., Milano, Italy, have reorganized, and would be willing to act as agents for Canadian manufacturers.

FROM ONE OF OUR "LONG DISTANCE" READERS.

8 Race Course Road,
Lahore, Punjab, India
April 29, 1921.

Editor,
Canadian Chemistry and Metallurgy,
Toronto, Ont.

Dear Sir,—To-day, as I was riding along on my camel, the mail-man appeared in the distance and when I opened the mail bag I found, among other things, a copy of "Canadian Chemistry and Metallurgy."

Many congratulations. I have forgotten all my chemistry, even the formula of alcohol. I've heard of polymers, but I no longer know who they are. However, I can see that "Canadian Chemistry and Metallurgy" is a mighty nice little magazine and you should be proud of it. I am especially glad to see that at least the smell of "oil" has crept into your pages.

At present I am out in Baluchistan, thinking rather longingly of an April day in Toronto, with the leaves just beginning to sprout, perhaps a gentle rain, and a temperature of around 50. Baluchistan is a synonym for "desert." It hasn't rained a drop here in three years, and the day before yesterday at noon the thermometer stood 142 degrees F. in the sun before my tent, and 123 degrees F. inside, and this is only April.

With my best regards.

Yours sincerely,

JOHN K. KNOX.

Quite aside from the fact that it is interesting to know that the paper is reaching all parts of the world and keeping Canada in touch in many fields, there is something in this letter for those who may feel that courses in chemistry offer narrow opportunities in life work. Mr. Knox but a very few years ago graduated in chemistry and mineralogy at the University of Toronto. How he got into the oil game is another story, but his chemistry did not hinder him at all. He is at present with the Whitehall Petroleum Corporation, Limited, of London, England, and has already had experience in most of the United States oil fields.—(Editor.)

EXPORT OF DYES BY CHINA.

Lately a large quantity of dyestuffs has been imported to Japan from China on account of their being bought cheaper than the importation from Europe and America. The reason for this is that when the quotations of dyes were rising in 1919 the importers of dyes in China sent big orders to Europe and America and the shipments began to arrive last year as the business depression set in. On account of this the market in China has been suffering from an over-stock of dyestuffs and the holders have been freely resorting to sacrifice sales. This circumstance, coupled with the violent fall in exchange, has made the import of dyes from China cheaper than their import from Europe and America.—"The Weekly Druggist" (Tokyo).

NEW POWER STATION FOR ABITIBI PAPER MILLS.

The power station at Twin Falls, which is to supply power to the extensions of the Abitibi Power and Paper Company at Iroquois Falls, Ontario, is almost completed. The station is equipped with four K. V. A. Westinghouse generators developing 24,000 h.p., which will be transmitted over a five mile line to the plant at Iroquois Falls.

The Case For Chemical Warfare*

The Rules of Warfare Discussed from a Modern Viewpoint with Special Regard to Poison Gases and the Place of the Medical Profession

By SIR WILLIAM J. POPE.†

THE recent war witnessed the introduction of many fresh military weapons; some of these were received with almost universal approval, whilst others provoked torrents of condemnation. The layman finds it difficult to understand this contrast. The apparently illogical manner in which praise or blame is distributed to any particular military novelty may well obscure the clear judgment just now so necessary to the selection of sound military methods for future use; some attempt should be made to discuss the whole question of innovation in military processes with a view of fixing essential principles and to removing obvious misunderstandings. Such a task as this calls for the co-operation of many minds of diverse types; in the present article a few considerations are advanced which bear intimately upon the whole subject.

The military mind always resents anything new. During the early part of the recent conflict I was repeatedly told by military men in responsible positions that the war was to be fought out on the same lines and by the same methods as applied during the Boer War; this fact should be remembered, because many gentlemen who held this conviction retain their official positions, and still exhibit signs of interest in terrestrial affairs when threatened by a demand for businesslike and progressive conduct. A gleam of hope is, however, discernible in that the military Trade Union has permitted dilution by the establishment in the service of many thoughtful men who achieved great things as progressive soldiers during the war.

Opposition to novelty by Government servants was as strong in the past as it is in the present. During the Crusades the use of the so-called Greek Fire was regarded as contrary to the laws of war, and even in quite modern times orders were given that soldiers captured in possession or rifled guns were to be shot out of hand. Four hundred years ago Ariosto explained in "Orlando Furioso" how, in Arthurian times, the fiend presented firearms to the hero, Roland, who was certainly in need of aid. Scorning this unchivalrous device, Roland threw it into the sea, whence it was fished up centuries later by the Germans, perfected by their abominable cunning, and used against mankind. Official conservatism was emphasized by the Church from the moment when Christianity secured political power; the second Lateran Council launched a threat of excommunication against those who used the arbalest, the machine for throwing big stones, against Christian troops. The permanent official parasite makes an abiding home in the blankets, and he and his kind, unlike Mark Twain's friends, always combine to resist the intrusion of a higher animal and to paralyze all effective movement. The permanent official will never lead; his future lies behind him, and ended when he took up his appointment. No hope of an enlightened policy concerning military methods can be described but in an instructed public opinion translated into action by responsible political and military leaders.

New Weapons Arising from the Great War.

Let us enumerate a few of the new military weapons forged during the last war, and consider the various ways in which these have appealed to the public imagination. Aeroplane warfare was entirely novel, and, despite official apathy, became a powerful and reputable instrument of war without much public protest. Poison gas warfare was new, but not entirely novel, because it was seriously proposed by the late Lord Playfair at the outset of the Crimean War. The autobiography of this eminent statesman and chemist shows that he understood the possibilities of chemical warfare, and regarded it as a very humane weapon. Thirdly, preventive medicine made, in 1914, its first serious appearance as an offensive arm; this subject is further discussed below. Many other novel developments in military methods, of course, emerged, but for our present purpose the above will suffice. Aeroplane warfare excited public acclamation; chemical warfare aroused universal execration; preventive medicine was welcomed as an entirely benevolent contribution of science towards the amelioration of suffering.

These diverse popular verdicts call for explanation; they can only be reconciled on the basis of some theory of warfare. Such a theory seems now capable of being stated in vague outline. War is very generally regarded as the highest form of sport; the exhilaration of the pursuit is enhanced when the quarry has the power of hitting back and of perhaps killing the sportsman. Aeroplane warfare ministers to the sporting instinct by increasing the excitement. Chemical warfare, on the other hand, is regarded as a dirty weapon; the man who uses it would shoot foxes and net salmon. Preventive medicine acts like a super-efficient game-keeper; it preserves the game for the legitimate sportsman, and hence is held in esteem.

This rudimentary theory indicates why chemical warfare is generally execrated whilst the military use of preventive medicine is universally approved. Let us, however, consider the results achieved by the recent use of these two new weapons.

In April, 1915, the Germans launched chlorine gas against the Allied troops on the Yser, with results which caused the gravest consternation. It is certain, and this is very important, that if the enemy had possessed the courage of his convictions—putting over a really considerable supply of chlorine and following up resolutely the advantage gained—the war would have ended in 1915. Fortunately for the Allies, however, German primary and secondary education is in the main classical and so does not help its victims to discriminate between theory and mere practice; the German High Command failed to realize what a powerful weapon they had in their hands and so did not apply it effectively.

*From "Chemical Age," London, May, 1921.

†President of the Society of Chemical Industry.

Chemical Warfare Here to Stay.

I am not attempting to excuse the use of poison gas by the Germans; there is only one reason, but that an all-powerful one, why they should not have used it, namely, that they had solemnly promised not to do so. No purpose would be served by discussing here the moral depravity and the executive incompetency of the German Staff in this connection, but one result of their action is clear: Chemical warfare has been introduced and has come to stay; the British Cabinet, the League of Nations, and all other authorities are alike powerless to prevent its use in any future serious war.

Public opinion concerning the effects of chemical warfare has been very ill-informed; the grotesquely misrepresented case laid before the public is well stated in a letter which appeared in The Times, of November 29, 1918, signed by eight of the most highly placed members of the British Medical profession, namely, the Presidents of the Royal Colleges of Physicians of London and Ireland, the Royal Colleges of Surgeons of England, Edinburgh, and Ireland, and the Royal Faculty of Physicians and Surgeons of Glasgow, together with the Regius Professors of Physics in the Universities of Oxford and Cambridge. Several of the offices here concerned are Crown appointments, and this fact, together with the eminence of the signatories, gave great weight to the document. The letter urges that the Comity of Nations should prohibit chemical warfare and states that "the use of gas is self-condemned for the following reasons: It is an uncontrollable weapon, whose effects cannot be limited to combatants; it is an "unclean" weapon, condemning its victims to death by long-drawn-out torture; it opens the door to infinite possibilities of causing suffering and death, for its further development may well lead to the devising of an agent which will blot out towns, and even nations.

Poison Gas Least Cruel of All Weapons.

The fact is that poison gas is far less fatal and far less cruel than any other instrument of war. One of the greatest discoveries made by the Germans was that "mustard gas" is a more efficient agent than any previously employed in chemical warfare for causing casualties; the introduction of this material led to an appalling lengthening of the casualty lists, and the fact that the French, Americans, and British had in sight an overwhelming production of this formidable substance was a large factor in determining the Armistice. Amongst the "mustard gas" casualties the deaths were less than two per cent., and when death did not ensue complete recovery generally ultimately resulted; it is unnecessary to dwell upon this merciful result in its contrast with the proportion of deaths among the casualties from projectiles and with the numbers of maimed, crippled and shell-shocked we see around us every day. Other materials of chemical warfare in use at the Armistice do not kill at all; they produce casualties which, after six weeks in hospital, are discharged practically without permanent hurt.

We may pass over the implied suggestions in the letter that the ordinary instruments of war do not affect non-combatants, that the "unclean" weapon is the only one which condemns its victims to death by long-drawn-out torture, and that chemical warfare should be abolished in that, unlike other agents, it is capable of improvement. Most people know that great numbers of non-combatants were killed by high explosive shell; all who have watched the casualties passing from the front to the dressing stations recognize that projectile wounds are far more ghastly than the lesions set up by chlorine, and those who have seen Verdun and Ypres know what high explosive has done already towards the blotting-out of towns. In order to focus attention upon the argument now being developed it may be noted that, although accurate statistics are not immediately available, the gas casualties in the recent war numbered several hundred thousands.

Casualties from Preventive Medicine.

Let us turn from this offensive weapon, which had a casualty-producing power of the comparatively small order just remarked, to that of preventive medicine, which was first employed effectively during the recent war. Every great soldier has realized that an army is limited in size by the difficulty of keeping it free from epidemic and communicable disease; previously this factor pinned the army dimension down to a unit of 100,000 men. When the resources of preventive medicine were properly applied the unit dimension became a million men. Preventive medicine made it possible to maintain 20,000,000 men under arms and abnormally free from disease, and so provided greater scope for the killing activities of the other military weapons; a competent observer gives 15,000,000 as the number of combatants killed in warfare between 1914 and 1918, and nine-tenths of this achievement is due to preventive medicine. Further, the keeping of these vast armies in health, with its accompanying disorganization of civilian activities, led to the dissemination of epidemic disease among non-combatants in all quarters of the globe. The civilian mortality from the mysterious war form of influenza alone amounted to scores of millions; this death-roll lies at the door of preventive medicine. We see, at the present moment, large tracts of Europe and Asia famine-stricken with a mortality of thousands per day, as the direct result of the efficiency of preventive medicine in keeping the whole man-power of a great part of the world under arms for so long a period; this is, again, the responsibility of the military medical services. In fact, for each soldier kept in the field by the army medical services, 10 or 20 non-combatants died, and hosts more will die, many by "long drawn out torture."

In this article I am endeavoring to establish some sense of proportion; whilst the surprise effects of chemical warfare aroused anger as being contrary to military tradition, they were minute compared with those of preventive medicine. The former killed its thousands, whilst the latter slew its millions and is still reaping the harvest. A perusal of The Times' letter in the light of the above facts will show that a far more powerful appeal to the comity of nations would have been framed if the words "lethal gases," "gas," "chemical agencies" and "gas warfare" had been replaced throughout by the expression "preventive medicine." There is, however, a further indictment against the letter.

The eight leaders of the medical profession referred to above are well aware that the military medical services, wielded as an offensive arm with such appalling consequences by their younger and still active colleagues, have brought infinitely more suffering upon non-combatants and neutrals than has chemical warfare or any other weapon; why did they address so misleading a letter to the public? It is charitable to suppose that they did not sit in conclave, discuss the bearings of the various appliances of modern warfare, and then draw up and sign this grave appeal for the abolition of chemical warfare; the letter bears internal evidence that its signatories had nothing to do with its compilation, but merely signed it unreflectingly at the suggestion of some crazy propagandist.

The Work of the Professional Propagandist.

In December last the Executive Committee of the

National Peace Council, in a resolution, noted "with profound regret that the British Government, as suggested by the Dyestuffs Bill and shown by the War Office appointment of a Research Committee, are contemplating preparations for the next war involving the employment of poison gas and all the latest possibilities of chemical discovery. It protests against this prostitution of science, and regards it as calculated to extend, perpetuate, and intensify the horrors of international strife." Here, as in the medical letter, may be detected the characteristic turn of phrase which marks the trail of the professional propagandist.

The influence of this publicity campaign is quite considerable. At the meeting of the International Red Cross Societies, held at Geneva on April 5, 1921, it was decided to urge all Governments to sign an agreement, in addition to the Hague Convention, for: (1) The complete prohibition of the use of poison gas in warfare . . ." and, in the House of Commons a few months ago, the Parliamentary Secretary to the War Office excused Government activity in connection with poison gas research, offensive and defensive, in terms of almost abject apology.

At the present time every aspect of national defence is under consideration; the enormous problems associated with national security and national economy demand that the discussion shall be carried out openly and in such a manner that the public will realize the issues at stake and grasp at least the principles of the methods involved. In view of the magnitude of the interests which arise we are justified in asking the leaders of the medical profession to lay before the public the reasons which led them, at a moment when chemical warfare had been, to a large extent, responsible for ending the war, to throw the weight of their combined authority into a grave appeal to our statesmen for the abolition of a very humane, although new, instrument of warfare. This request is a reasonable one, because the document referred to is the only presumably official and authoritative statement of the case as against chemical warfare which has appeared and has naturally furnished the text for many attacks upon this arm; apart from inherent absurdities, the letter errs, in my opinion, in assuming that any one form of warfare can be more bestial than another.

It is, of course, possible that a League of Nations may be able to limit armaments; the magnitude of the industrial operations which must collaborate in the production of big guns or battle ships would facilitate the detection of an infringement of any convention. New and more potent agents of chemical warfare can, however, be elaborated in obscure laboratories and kept in secret reserve against the day when mobilization gives the signal for mass production; this process is, indeed, in active progress. A distinguished chemist, Brigadier-General Harold Hartley, has told us that during the enquiry into German methods for making "mustard gas" which followed the Armistice, one of the respondents asked—"Why are you worrying about this when you know perfectly well that this is not the gas we shall use in the next war?" The Americans, who came into the war at their own convenient time, encountered chemical warfare when it had become fully established, and were thus more impressed by its potentialities than the other Allies, who had more or less grown up with this new arm. Of the total American casualties, about 30 per cent. were due to gas, and of these about 90 per cent. arose from skin burns; of the gas casualties 3 to 4 per cent. died, and something like 95 per cent. made complete recoveries. These facts impressed our trans-Atlantic cousins. They have established a Chemical Warfare Service on a peace footing with a personnel of about 1,600 men, and have budgeted for an annual expenditure of four and a half million dollars on research connected with the development of the new weapon; they recognize that immediately an authoritative definition of chemical warfare is subscribed to by the members of any analogue of the Hague Conference much of the inventive power of Christendom will be devoted to circumventing the convention. This task will be an easy one in view of the great variety of effects producible by chemical agencies. In the late war many cases occurred in which high explosive shell liberated sufficient carbon monoxide to kill, and it will be a simple task to devise high explosive, a most honorable weapon, which will evolve large amounts of this excessively poisonous gas, against which all known protective masks are useless. Further, no reason exists why chemical shell should not be made which does not kill but produces local anesthesia, causes violent sneezing for a few hours, or leads to some form of physiological intoxication which may prove of great military value.

Impossibility of Limiting Chemical Warfare by Hague Conferences.

The questions which arise in connection with chemical warfare call for judgment by an educated public opinion, informed by scientific men and instructed by men of affairs. At the first use of chlorine, in 1915, our prelates implored the Allies not to soil themselves by retaliating upon the Germans in kind; had these sonorous voices been heeded we should inevitably have lost the war. Our medical leaders, posing as possessed of absolute knowledge of fact, have demanded the abolition of chemical warfare; these are neither scientific men nor men of affairs. All medical injunctions have to be reviewed in the light of a weighty judgment by Louis Pasteur, one of the most sagacious intellects which science has ever had in its service:

"Malheureusement les médecins se plaisent volontiers dans les généralisations anticipées. Beaucoup d'entre eux sont des hommes d'une rare distinction naturelle ou acquise, doués d'une intélligence vive, d'une parole élégante et facile; mais plus ils sont éminents, plus l'art les absorbe et moins ils ont de loisirs pour le travail d'investigation. Poussés, néanmoins, par la passion du savoir, propre aux esprits d'élite, et qu'entretiennent les relations de la haute société de plus en plus curieuse des choses de la Science, ils s'emparent avidement des théories faciles, spécieuses, d'autant plus générales et appropriées aux explications vagues qu'elles sont mal établies par les faits."

Chemical and Air Services to Dominate Future Wars.

Democracy has provided us with a Government which is doubtless better than we deserve, and while we discuss our attitude towards the subject the Government has had to decide whether to refrain from or to persist in action concerning chemical warfare. It is satisfactory to know that our administrators are moving in accordance with the carefully framed resolutions which, after mature consideration and ample discussion, were sent to the Prime Minister and other members of the Cabinet by the British Association for the Advancement of Science a year and a half ago; these resolutions strongly advocated the formulation of definitely organized schemes for national research on all scientific questions relating to warfare, public health, food production and national commerce and industry. It is, however, interesting to note that this country is de-

voting far less effort and money than is America to the development of that military arm which, with the air service, will dominate all future wars; interesting because it would seem that the charlatan and the propagandist have screamed so loudly on the other side of the Atlantic that they stand revealed before the more thoughtful as a mere public nuisance. Here they are taken more seriously, and have certainly led us to pursue the study of chemical warfare with less ardor than has been shown elsewhere.

Notwithstanding limitations, we must conclude that our Government has done wisely in following the course pursued by other Governments, also potential members of that League of Nations which is to end all strife, and in deciding to prosecute the study of the modes in which chemical warfare can be best utilized in modern military operations.

Progress in Rubber Chemistry and Technology.

A VERY interesting review of recent literature has been presented recently by Dr. Philip Schidrowitz in Chemical Age (London). We can only call attention to it here and point out a very few of the lines of thought developed. The work being done on the mechanics of vulcanization and rubber stress strain curves is receiving much attention. Reducing the mathematical considerations involved to a statement, it is generally agreed that a rubber A which shows greater resistance to stretching than B will also (at the correct cure) show a greater total distensibility for a given load or do more work than B after the initial stage of stretching is passed and final stage entered upon. With regard to the rubber molecule while work is being continued in different places, the conceptions of Harris and Pickle in general hold.

Germany made a real effort to solve the synthetic rubber problem during the war without much success. This was done at the Bayer Works, and now manufacture is abandoned. What was made was an inferior substitute at a cost of about $2.50 a pound. The best German result was obtained on what was called "Methyl" rubber (derived from methylisopropene). For hard rubber products this was fair, but for other purposes the result was far from desirable. At the same time this synthetic product was actually used in balloon fabrics. A typical mix for solid tire was 60 per cent. methyl-rubber (made by the cold process) sulphur, and 6 per cent. of a softening oil along with mineral filler.

In the industry it is thought that "open" horizontal rolls will give place to enclosed mechanical mixers operating by means of masticating blades. These machines are desirable from nearly every standpoint, saving labor and ensuring more consistent working. In the making of tough and dry mixtures suitable for tire treads and in using fine powders and volatile materials, the new method is superior from the health standpoint. The fundamental point in favor of open rolls is the ability of the operator to judge by the sense of touch, the condition of the mix. To meet this, the mechanical mixer uses for one thing a current meter which will measure power used over a short period and which indicates the plasticity. A better method of controlling the temperature is as necessary an improvement as the power control. Solid tires built mechanically by running material from the calender onto a drum is an improvement over the hand method. In many works temperature control of "curing" is a difficult and poorly handled problem. Gauges and thermometers may be either incorrect or in the wrong position. One effective way to avoid trouble is to have a reducing valve either on or quite close to the vulcanizer, coupled with a large margin of steam pressure on the far side of the valve, and an open exhaust at the steam exit.

Progress from mineral accelerators to organic catalysts goes forward, but litharge in particular is not likely to be displaced entirely. Most organic accelerators are either strong bases such as di-ethyl-amine, piptridine, etc., or compounds resulting from the interaction of bases with such substances as nitrous acid, formaldehyde, or carbon bisulphide. Caustic soda itself is a powerful accelerator so that compounds made by action of alkalis and alkali metals with alcohols and phenols are to be considered. The organic accelerator is most valuable because a small amount produces the necessary result.

A possible cold process of vulcanization has been evolved by Peachey. By this method the rubber is exposed to SO_2 and H_2S. The mix absorbs the gases and in quantity according to the equation $2H_2S + SO_2 = 2H_2O + 3S$. The time compares favorably with the length of cure required for non-accelerated mixings by the ordinary process.

OXIDATION OF PARAFFIN BY OXYGEN GAS.

Heretofore little success has been attained in the many attempts that have been made to produce directly oxidation products, such as fatty acids and alcohols, from the hydrocarbons of paraffin and similar substances. C. Kelber has recently found, however, that in the presence of certain catalyzers, such as oxides of manganese, oxygen gas brings about such changes with considerable rapidity. His most interesting observation, however, at which he was astonished, was the fact that oxygen gas, in the absence of any catalyzer, when it is passed in a finely divided condition into melted paraffin at a temperature of 140 to 150 deg. C. begins to act after a time, a watery liquid and also a mobile oil distil over into the receiver, while carbon dioxide is another product of the reaction. If the rapidity of the oxidation is not checked either by cooling or by diminishing the stream of oxygen, the temperature rises with increasing violence of the reaction to above 200 deg., and the oxidation is finished in 4 or 5 hours. At the time of the publication of this announcement the products of this reaction had not been studied, but they appear to be similar to those produced in the presence of a catalyzer, where there is a yield of 40 to 50 per cent. of fatty acids insoluble in water but soluble in petroleum ether, 5 per cent. of fatty acids insoluble both in water and in petroleum ether, a small percentage of unsaponifiable matter, and also some water-soluble and volatile acids as well as other compounds, some of which are alcohols. The fatty acids insoluble in water give alkali-salts which show a high frothing capacity. It seems quite possible that this oxidation process may be of commercial importance. (Berichte, 53, 60; American Journal of Science, July, 1920. Abstract.)—From "Technical Review."

NEW MARITIME PULP MILL.

The new Kraft pulp mill and plant of Clarke Bros., at Bear River, N.S., commenced operations during the week of April 11th. Clarke Bros. are widely known lumbermen and woodworkers, and their new Kraft plant will have a capacity of nearly 60 tons of Kraft pulp daily. Their old Kraft mill had a capacity of 30 tons daily.

The Manufacture of Starch, Glucose and By-Products

R. H. WILLIAMS.*

THE raw product for the manufacture of starch in Canada is, of course, maize or Indian corn, and is imported from the great corn belt of the United States. Occasionally a little native corn is used for this purpose, but most of that grown here is for feeding live stock. It is harvested before complete maturity, cut up and stored in silos to make ensilage, one of the principle winter feeds for cattle.

Probably owing to the fact that the summer season in Canada is somewhat shorter than in the United States, our corn shows a lower percentage of starch. An average sample of imported grain shows 55 to 60% starch, 4.50 to 5.50% oil, and moisture anywhere from 14 to 20%, according to the time of the year. Of course, starch may be prepared from any natural product rich in the proper carbohydrate, and the process is mainly a mechanical one. In England it is prepared chiefly from rice, whilst potatoes are employed in Germany. It is merely a matter of economic conditions.

Manufacturing Process.

On arrival at the starch works the corn is transferred to storage bins, and from these it is used as needed, first passing through a fanning mill to remove chaff, or dirt. The corn is then spouted into the steep tubs where it is soaked from one and a half to two days in water containing about 0.3% sulphurous acid. This solution is circulated through the corn, and by means of steam, heating is kept at a temperature of 140° F. The sulphurous acid has a softening effect on the glutinous parts of the grain and prevents fermentation. The steep water is prepared by causing a spray of water to pass down through a fume chamber containing sulphur dioxide gas produced by burning sulphur in iron ovens. This gas dissolves in the water forming the solution of sulphurous acid. From the steeps the grain is passed through a mill having two parallel vertical steel plates, revolving in opposite directions and carrying studs. Thus the corn is thoroughly broken up, but not ground fine. The broken corn, with water, now passes through what are called the germ separators; long metal tanks containing agitators which keep the mass in continual motion. In this way the germs are loosened from the other portion of the kernel, and being lighter, they rise to the surface, where wooden paddles continually passing, draw them over one end, from which they are carried to the shakers. The shakers are sieves of bolting cloth kept in continual motion back and forth, having a steady stream of water playing on them. In this way the germs are washed and any adhering starchy liquor is pressed out as they pass through the squeezer after leaving the shakers. Finally the germs are dried and go through the oil press to extract the corn oil. The other portion of the kernel, which sank to the bottom of the separators, also goes to a set of shakers and a squeezer. Here the starch granules with most of the gluten are washed through the bolting cloth, while the fibrous portions, called slop, pass over the ends of the sieves.

Starch Separation.

The starch and gluten liquor from the shakers is agitated in tanks and passed over the starch runs, or troughs, which are narrow, long and shallow, sloping gradually towards one end. The starch, being heavier than the gluten, sinks to the bottom, and the gluten is carried off the end, down to cone settlers, where the water is siphoned off and the gluten liquor run from below to the feed presses. The starch is shoveled from the runs into small cars and dumped into breakers, where it is mixed with water and washed by decantation. After the starch has been thoroughly washed it either goes to the converters to make glucose, or to the starch floor to be dried by steam or hot air, according to whatever brand is desired. In addition to the common table and laundry starch there are on the market, different grades of soluble starches, classified according to their pasting characteristics, into thick and thin boiling. In laundry work and the textile manufacturing there is a demand for a starch paste thin enough to penetrate the fabric without coating the surface and at the same time having body enough to give the required stiffness. Grades are made as desired by the action of heat and very dilute hydrochloric acid which lightly dextrinizes the starch. All shipments of soluble starch are tested for fluidity by adding a dilute alkaline solution to a small definite sample, and allowing it to run through a special funnel for a fixed length of time. The quantity which runs through in this time determines the extent of solubility.

Manufacture of Glucose.

For the manufacture of glucose, the green starch is taken from the tables to a mixing tub and diluted to a thick cream. From here it is pumped with the required amount of acid for conversion, into the vertical cylindrical copper or brass converter. From time to time samples are taken out and tested with a weak iodine solution. The deep blue which starch shows changes as hydrolysis proceeds, passing into violet, then rose, red and reddish brown until gradually all color disappears. Heat and pressure are utilized to hasten this action, and if grape sugar is desired the conversion is carried to the point where no dextrine is precipitated when the sample is poured into strong alcohol, while for glucose it is not carried on so far.

The converted liquor is then blown out of the converter into the neutralizer, a large covered wooden tank with stirrer, where it is treated with soda ash until nearly all of the acid is neutralized. From here it passes through filter presses and through bone char filters twice. The liquor is then boiled down in vacuum pans, passed again through fresh char filters and boiled down finally to the desired consistency. A little bisulphite of soda is added to bleach and preserve the product, which is run into the cooler and from there into barrels or drums for shipment. The glucose is a thick, viscid syrup, clear and colorless, sweet but flavorless, and is put on the market at four different densities, namely, 42°, 43°, 44° and 45° Baume. Table corn syrup is identical with this glucose except that it is not boiled down nearly so much, and coloring and flavoring is added. The grape sugar mentioned above, on cooling, forms a hard, waxy solid, containing a little maltose, but is mostly dextrose; while the glucose contains dextrine, maltose and dextrose. The bone char, after being used for some time, becomes contaminated with organic matter, but may be cleaned by passing hot water through the filters. The char is partially dried, put in

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vertical retorts and heated without access to air, to decompose any of this organic matter which may not have been washed out.

By-Products.

The chief by-product in the manufacture of starch is the meal or feed which is shipped and sold in 100 pound bags. Three main substances go to make this product, namely, the slop from the shakers, the oil cake from the oil press, and the gluten liquor from the cone settlers. The slop and the gluten having passed through the feed presses to remove the water, go into large revolving cylindrical dryers, until sufficiently dried to grind with the oil cake, making a feed with moisture content preferably about 10%. In addition to the three substances mentioned, a fourth is sometimes added. It is the solid matter contained in the used steep water, procured by evaporating it and passing the residue through presses and driers. This solid matter consists principally of soluble protein and mineral salts. Manufacturers of meal or feed must guarantee their product, under government license, to contain at least a specified minimum percentage of protein and fat, and maximum percentage of fibre. Consequently the composition is controlled at the plant to see that standards are maintained.

Corn Oil.

The other by-product in the starch industry, namely, corn oil, has recently come into considerable prominence as a soap oil. As explained above, it is extracted from the germ by means of the oil press. This oil is a viscous liquid of a bright amber-yellow color, has a faint and peculiar odor and sweetish taste. It has a comparatively high sp. grav., being about .92, and a saponification value of 18.4 to 19. Shipments are generally tested for free fatty acid to see that the oil has not become rancid.

Laboratory Control.

The laboratory work in connection with a starch plant is not only analysis of the finished product, but also the testing of the material during the process of manufacture. This gives a check on the efficiency of each operation. For instance, samples of the slop from the shakers are tested for starch content to determine if it is being washed properly. The same is done with samples of germ from the shakers. Occasionally small portions of the gluten liquor from the cone settlers are dried and ground and then tested for starch. This shows whether the starch is settling properly or coming over with the gluten. The oil cake from the oil press is watched closely and the oil content of samples is estimated to see if the press is doing its work. As a purity test, a protein determination is made on the starch before going in the converter, and the resulting glucose or grape sugar is also tested for protein. By comparison one can judge how well the bone char is doing its work. Thus the chemical laboratory serves a useful purpose in every-day operations in this industry, and although the process has been termed mechanical from one standpoint, it offers a good field for chemical investigations and general efficiency engineering.

KILLING BRITISH CHEMICAL INDUSTRY.

The Key Industries bill, now before the British Parliament, is considered by H. A. D. Jowett, D.Sc., as necessary to protect the chemical industry from collapse, many factories having closed and thereby added to the unemployment caused by the flood of German imports. Dr. Jowett says in part:

"The climax was reached when Mr. Justice Sankey ruled that under the Order-in-Council the Government could not prevent the importation of drugs. The natural result followed; drugs poured in from other countries, and though for a time we were able to meet competition, the prices of drugs gradually fell until a crisis was reached. Added to this was the extraordinary depreciation of the German currency.

"The wages paid in Britain in the fine chemical trade are approximately three times what they were before the war; the German wages are also approximately three times, and a German workman at the present time is getting about 75 marks a week; this at the old rate of exchange would be about 75s., something similar to our own wages, and, therefore, would be no advantage to our German competitors; but with the rate of exchange as it is, 75 marks is equal only to 6s 3d—that is to say, the German workman works for an equivalent at the present rate of exchange, of 6s 3d per week.

"How can we hope to compete under such circumstances? There is no question of profit involved here; the competing prices are actually below the factory cost."

GERMAN FLUORSPAR INDUSTRY.

The largest fluorspar fields in Germany are situated in the Hartz, Upper Palatinate, Thuringian Forest, and Black Forest, states a report issued by the U. S. Department of Commerce. The best quality is produced in the Upper Palatinate. The fluorspar found in the Upper Palatinate contains generally from 95—98 per cent. of fluoride of calcium, and relatively little silicic acid. Most of the fluorspar in Germany is consumed at present by the iron industry. In the case of this kind of utilization, broken materials suffice. Other consumers are the glass industry and the chemical and enamel industries. The utilization of fluorspar in the iron industry has made steady progress in consequence of the shortage of coal since the armistice, since fluorspar increases the fluidity of the fusible material and thus effects an economy of fuel, although at the cost of the quality of the resulting product. Consequently, it is probable that post-war statistics will show an increase of the consumption of fluorspar by the iron industry at the expense of that of the glass industry.

IMPORTANCE OF EARTHING IRONWORK IN ELECTRICAL CONVEYORS.

In a Vienna workshop an electric goods elevator driver was found dead in his seat, evidently from shock.

On examination the cause of the accident was traced to defective contact on the electric safety device which prevents the lift-motor operating until the iron lift door is closed. The seat and its framework are earthed and, therefore, a voltage exists between these and the individual phases of the 220-volt 3-phase supply, which, according to the state of insulation of the whole system, often nearly approaches 200 v. The iron lift doors are not earthed. Owing to the defective contact, the iron door in closing became alive, and thus a voltage existed between it and the operator's seat, which was the cause of the man's death. The accident proves the importance of earthing all ironwork used in conjunction with electrical apparatus, irrespective of voltage, particularly where alternating current is employed. (F. Wach. Elektrotechnik und Maschinenbau).—From "The Technical Review," London, England.

Canada's Coal Problem*

(A Further Study)

By F. W. GRAY.

AT the annual meeting, a year ago, the writer read a paper on "Canada's Coal Supply," and at the Winnipeg meeting, in October, followed up this paper by adducing the later statistics of production and supply then available, and emphasizing the quite obvious importance of the Western coalfield to Canada, arising from the concentration of 99.3 per cent. of our coal reserves west of the Souris lignite beds.

In the events of the year that has intervened there has been much to encourage those who urge that the problem of Canada's coal supply should be viewed first from the standpoint of national independence and defence, and that apparent commercial standards should be relegated to their proper position of lesser importance. The word "apparent" is designedly chosen. The cost of coal to Canada has for some time been largely determined by the purchasing power of our paper dollar, and this is, in its turn, largely set by the ratio between the coal we produce and the coal we import, so that, paradoxical as it may seem, apparent cheapness from the individual viewpoint may be the rankest prodigality from a national viewpoint.

The domestic production of coal during 1920 was the largest in our history and this is a matter for unreserved congratulation. As compared with 1919, we found 2½ million tons of coal, the equivalent of a $25,000,000 gold shipment, to New York in support of national solvency.

Nevertheless, the 1920 production was 5 million tons below the production capacity of the existing coal mines, a quantity that applied to domestic requirements would have been equivalent to a further gold shipment to New York of not less than $50,000,000, ignoring the stimulus to our internal economy that would have proceeded from the mining coal at home. The output capacity of existing collieries is, however, by no means the capacity of domestic coal fields situated within proved economically possible transportation distances of home markets.

Possibilities of Eastern Canada Coal.

The maximum possible production of the existing coal mines of Nova Scotia and New Brunswick has, for the purposes of the foregoing calculations, been placed at 8 million tons per annum, but there is no insuperable difficulty in raising this production—given time and expenditure—to 10 million tons. Such a production would make the Maritime Provinces and Newfoundland, Quebec as a whole, and a considerable area of Ontario completely independent of extra national sources of supply. In making this statement, it is of course contended that anthracite is not a necessary import in any Canadian territory within economically-possible transportation distance of domestic bituminous coal mines.

The production of the Western coal field is anything that Canadian opinion and support likes to make it. There is no limit fixed by the availability of coal, either in regard to quality or quantity. The gap—the apparently unfillable gap, under existing conditions of transport facilities—is Ontario. Even Ontario could be made accessible to Nova Scotia coal by a deep water-way from the sea to the Great Lakes, and in all probability will be so made accessible by a succeeding generation.

For the present, therefore, Ontario must look to the United States for coal, and, in recent years, Ontario could not look elsewhere for coal, seeing that even in those Canadian provinces plentifully supplied with coal, or situated within reach of the coal fields, the consumption exceeded the domestic production. It is a proper thing that Ontario should import coal, because it is a necessary thing, but it is submitted that it is an improper thing from a national standpoint that the other provinces should import coal from extra-national sources, because it is unnecessary.

Two newspaper despatches may be quoted as instancing typical viewpoints that are based on error and are subversive of national interests.

One despatch from Ottawa, dated 18th January, states "That the danger of a coal famine in Canada this winter has been entirely removed, unless something should happen to interrupt importations of hard and soft coal from across the United States border, is the view expressed to-day by the Dominion authorities. A second despatch, from Washington, quotes a U. S. Senator, speaking in a debate on a bill that proposes the raising of a higher tariff wall against Canadian goods in the United States, as remarking: "Canada, as she has always done, will continue to buy where she can buy cheapest, and if she can buy cheapest in the United States, she will continue to buy from us."

The impression given by the Ottawa despatch is that it reflects a resignation in official circles to continued dependence upon the United States for coal, and this can only be based upon an unfortunate disbelief in the possibility of independence. The jibe of the U. S. Senator galls deep, because it is true. That cheapness does not altogether consist in a relatively smaller outlay of money is not any less true. These instances are quoted because they reflect a widespread opinion, that it is the duty of the Institute to inform and correct.

Existing Situation Unsatisfactory in Several Ways.

The foregoing review about sums up the existing situation, which the writer submits is unsatisfactory in the following particulars:

(a) Coal output in Canada is disproportionately small in regard to the extent of the domestic coal reserves.

(b) The domestic output has not kept pace with the population of the country, and the growing consumption of coal per capita.

(c) That while some dependency on the United States for coal is inescapable, there is no good reason for the annually increasing dependency of recent years.

(d) That there does not yet exist a unified public opinion in Canada that will demand the use of domestic mined coal to the maximum point of substitution of imported coal.

Before considering possible remedies, the following facts regarding the relative coal resources of Canada are submitted, not as anything novel, but as bearing on the question at issue.

The coal beds of Canada, with a content estimated at 1¼ thousand billion tons, are about equal to those of the

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whole of Asia. Canada has 17 per cent. of the world's coal reserves, and 71 per cent. of the reserves of the British Empire. With a consumption per capita that will ultimately exceed that of less northerly countries, Canada has a production of 2 tons per capita, Britain and the United States have a production of 6 tons per capita.

The coal consumption of Canada has always been restricted by insufficient supply, nor have the combined domestic production and imports in recent years met the requirements of the country. Manufacturing has been restricted, selling prices have been unnecessarily high, and the country has never been on "easy street" in regard to coal supply. With present population, and potential manufacturing ability, Canada requires not less than 40 million tons annually. The historical maximum production of 16 million tons in 1920 is entirely inadequate. With a population of 10 millions, Canada should use 50 million tons of coal annually, if she is to achieve maximum manufacturing ability, freedom of political action, and domestic comfort.

In regard to the attitude of the United States towards our coal supply, it may be suggested that because of the exaggerated dependence of recent years that Canada has suffered through neglect to develop her own coal beds, we attach too great importance to what is, after all, a matter of quite insignificant value to the United States. That country has an annual coal production which exceeds 600 million tons without having attained anything like the maximum possibility of production. The tonnage that the United States exports to Canada bulks small in that country's business, but to Canada it is a matter of economic life or death, and has probably the most important bearing on our continued political independence, being indeed our most pressing internal problem. We need not fear any criticism from informed opinion in the United States if this country develops its coal producing capacity to the utmost, but we do risk some justifiable and pitying criticism from the informed and well-disposed among our neighbors, and something worse than the ill-informed and hostile minority that is clamorous in inverse ratio to its numbers, if we continue to drop behind in the great international game of industrial emulation in which coal and iron are the king pieces.

Suggested Remedies for the Situation.

What are the remedies and what of the future?

There are three territories to consider, namely:

1. Eastern Canada, tributary to the Eastern Coalfield.
2. The "Gap of Ontario."
3. The Province west of Fort William.

Two trade outlets are open for coal in the East, the home market (including Newfoundland), and the overseas export market. It does not seem an unreasonable aim that the Maritime Provinces and Quebec, including all the railways that serve this territory, should be supplied with domestic-mined coal. The larger and more stable the market the more cheaply will it be possible to mine coal in Nova Scotia, and it may be permissible to contend that on no national grounds can the purchase of coal from extra-national sources for national transportation lines be excused or defended without grave inconsistency.

The export trade, in view of the limited quantity of the coal reserves in Nova Scotia, is probably not one to be encouraged to a point of national deprivation, but it has never reached that point, and what promised to be the commencement of a permanent and profitable trade with Europe was quickly killed by the ill-advised export embargo of last summer.

Export trade is desirable at the favorably situated Nova Scotia mines and will probably develop later, and irrespective of conditions in Europe that are now passing and are losing some of their urgency. The record of the operators of Nova Scotia is sufficient to show that they have always paid first attention to the home market. No Nova Scotian coal has been offered for sale in the Montreal market since about 1916, but it will appear again in the summer of 1921.

In Europe, the nationalization of coal mines is a burning political question. Millions of men, including not few Canadians, have fought and died for the coal fields of Europe. The coal fields of the Maritime Provinces is a lone and singular deposit in all Canada for a space of 1,800 miles. In this distance it provides the sole source of all the means of modern national defence that we have any right to call our own. It is producing, and has produced for six years, less than it did in 1913, yet the only definite action taken in regard to this incalculably precious national asset during this whole period has been the imposition of control and embargo.

The record is one that shows not indifference, because there is no necessity to apply such an epithet to men who have doubtless done their best to pilot the ship of state, but it does show, plainly, that the primary national importance of coal supply has escaped the attention of our statesmen.

As to the "Gap of Ontario" there is little to be said except to urge the lessening of the gap by the maximum extension of the radius of distribution of the eastern and western coal fields, and to support any favorable engineering opinion on the feasibility of a deepening of the St. Lawrence waterway.

In regard to the Western Coalfield, in which is included the continuous deposits of Saskatchewan, Alberta and British Columbia, and the detached fields of Vancouver Island and Northern British Columbia, the conclusion cannot be avoided that here lies the future workshop of Canada.

In his classic work on the "British Coal Trade," Prof. H. Stanley Jevons, writing before the war, in regard to the untapped coal fields of the world, stated: "We have to recognize that the Malthusian check to the increase of population operates in a totally different manner when people of any region change by the aggregation of capital and spread of education from a purely agricultural community to a manufacturing nation with an organized modern commerce. A great stimulus to such a change will come wherever coal fields exist; and the population will thrive and develop upon the coal fields of the world, almost like flies upon honey."

Edwin C. Eckel, in an important recent book on "Coal, Iron and War," points out that under modern conditions, given the possession of raw materials, the industrial growth of a community need not be slow, but may even be compressed into a period so short as ten years. The application of these two mature opinions to the conditions in the Canadian West emphasize the obvious. Hitherto our dependence on extra-national sources of fuel has been associated very largely with the industrial eminence of Ontario, which is based on Pennsylvanian coal; but the new orientation which we see in the West promises an infinitely larger industrial growth over the western coal beds. Here, in the writer's opinion, will be founded the

great pillars that will, in the days to come, support an industrial fabric transcending all present imaginings, and will, if wisely guided, prove "that most stable guarantee of our political permanence as an independent people." The coal fields of the West are large enough to build a nation on.

The most hopeful sign in this connection is that the people of the West have realized their coming industrial importance, and those who were privileged to attend the Winnipeg meetings of the Institute realized that, whatever may be the case in the East, there has been formulated in the West that first requirement for a successful coal industry, what we will call a "coal conscience," among the general public.

It is evident, however, that rapid as may be the growth of population in the West, the outlet for coal there is smaller than the existing capacity of the collieries unless an export trade is found possible. British Columbia is favorably situated, and its export trade is growing and is assured by the lack of good quality coal, except in Vancouver Island, along the whole length of the Pacific seaboard of North and South America.

The possibility of exporting Alberta coal to the States lying immediately south, and to outside points via Vancouver, is not by any means a remote one, and the extent of this trade is limited only by the market available. The writer suggests that the present lop-sided arrangement of coal interchange between ourselves and the United States may be restored to a point less endangering to national safety, and less humiliating to national pride, and at least to the fifty-fifty basis that formerly obtained, by the following procedure, that is submitted as possible, namely,

(a) Complete independence of imported coal in the Maritime Provinces and Quebec, and in part of Ontario, achieved by enlargement of the Nova Scotian production.

(b) A moderate export trade from Nova Scotia to overseas points.

(c) Complete independence of imported coal in all Canada west of, say, Fort William, or Fort Francis, achieved by enlargement of transportation facilities, and recognition by the western railways that coal has become a permanent and growing feature of rail transportation in the West, both eastwards and westwards of the Alberta bituminous areas.

(d) Organized effort to secure export markets for Alberta coal, both southwards into the States and through the ports of Vancouver and Prince Rupert.

(e) Enlargement of the export market of Vancouver Island coal.

OIL SHALE INDUSTRY IN SCOTLAND AND ENGLAND.

Mr. Victor C. Alderson, President of the Colorado School of Mines, publishes a long report in a recent issue of the Quarterly of the School for October, on "The Oil Shale Industry in Scotland and England." We extract the following particulars from the part devoted to the "Oil Shales of England."

After describing briefly the oil shales of Dorset, Lincolnshire, Yorkshire and Norfolk, and mentioning English Oilfields, Limited, the author goes on to say that fortunately for the oil shale industry in the United States, sulphur in the oil shale there has not yet been found in a quantity detrimental to the oil produced. Also, there is little or no sulphur in the Scottish shale. But in England the known beds of oil shale all carry so much sulphur as to make the oil unmarketable except for fuel. During the war the British Admiralty raised the allowable limit of sulphur in oil to three per cent., but paid a low price for any above two per cent. The one great obstacle standing in the way of the development of the oil shale industry in England is the desulphurization of the shale without spoiling the oil. Logically there are three methods of attack:—(1) During the retorting of the shale an attempt may be made to remove the sulphur by such agents as lime and caustic soda. (2) As soon as the oil vapours and gas are evolved, and before condensation, they may be passed over desulphurizing agents. (3) After the vapours have been condensed the oil may be desulphurised by some chemical means. Many patents have been taken out to cover processes and many individuals claim to have a solution, yet no process has yet appeared that satisfies commercial and industrial requirements. During the war the need of a domestic supply of oil was felt so keenly that the British Government investigated every possible source of supply. In the case of oil shale the presence of an excess of sulphur stood as an insurmountable obstacle. It remains the great unsolved problem before the technical men of Great Britain. When its solution comes, as it probably will some day, great quantities of oil shale in the Kimmeridge formation, now commercially valueless, will become a source of great wealth to the British Empire, and of economic importance in supplying an additional domestic supply of oil.

On account of the shortage of petroleum and its products during the war, especially fuel oil for the Admiralty, the British Government directed its attention to the possible production of petroleum from home supplies. First of all, efforts were made to increase production from the known deposits of oil shale in Scotland by speeding up the mining of raw shale, by using to full capacity the retorts in use, and by putting in use older retorts that had been lying idle. By these efforts the output was increased, but not to a degree sufficient to meet the present needs. Investigations were then carried on with the deposits of oil shale, which were known to exist in Dorsetshire, Norfolk, and elsewhere, but on investigation these shales were found to produce an oil too high in sulphur for Admiralty purposes, and various retorts and processes were tried in order to produce a suitable oil from these shales and an oil which was free from sulphur. In 1917 the Inter-departmental Committee carried out experiments with the Del Monte retort, a low temperature distillation process, on the Kimmeridge shales which gave an output of 45 galls. a ton, but carried 6.6 per cent. of sulphur. An endeavor was then made to find a process for eliminating this sulphur, and from June to October, 1917, experiments were carried on and investigations made of the process invented by Heyl, which failed to produce the results obtained by the inventor. Other processes examined were Burnet's process for desulphurizing the oil obtained from the Norfolk shales. Still other processes investigated were Tozer's system for producing oil by low temperature vacuum process distillation, the S.O.S. system for the retorting of sewage sludge, the Simpson system, the Moeller system, the Maclaurin system and the Lamplough process. Oil shales from other parts of the country were also investigated, namely, at Anglesey, and at Skipton, in Yorkshire. Having failed to find any satisfactory process for eliminating sulphur, attention was directed to the cannel coal and torbanite which were known to exist in various

parts of the country, and which were capable of producing a high percentage of oil.

The English oil shale deposits are essentially different from those investigated elsewhere and present specialized problems of desulphurization, retorting, and refining. They are particularly characterized by:—(1) A high specific gravity; (2) a large content of olefines and unsaturated hydrocarbons; (3) a low content of the paraffin and naphthenic series; (4) a high percentage of sulphur. To those who foresee a high price for the ammonium sulphate produced from shale a note of warning should be sounded.

After two months' study of the oil shale industry in England and Scotland, the author is led to the following conclusions:—

(1) The present Scotch methods are well adapted to the shale treated; they are commercially successful and meet the local conditions.

(2) The Scotch plants are the result of seventy years of operation; they have been improved from time to time, but naturally are not now so arranged as to be highly efficient from an operative point of view, yet it would be folly to scrap them and rebuild in more modern plans.

(3) Scotch methods should not be slavishly followed in other countries unless conditions are identical.

(4) The problem in Scotland is one of operating efficiency—the difference between cost of production and selling price.

(5) The problem in England is not yet a commercial one—but technical.

(6) The presence of an excess of sulphur in all oil shale deposits of England demands that some effective and economical method for the elimination of the sulphur be devised.

(7) Where sulphur does not occur to an objectionable amount, as in the United States, the serious problem is the design of an efficient retort.

(8) Many retorts are in process of development. At present it is virtually impossible for any one (except the inventor himself) to select the best.

(9) In the author's judgment, the successful retort will be one of three types:—(a) The present Scotch type, where local conditions are identical with those in Scotland; (b) a vertical modified Scotch type, adapted to shale rich in oil, but low in nitrogen content; or, (c) a horizontal type, based on correct scientific principles and absolutely new.

It is not impossible that successful retorts of all three types will result. The keynote to the successful production of oil from shale is a retort adapted to the character of the shale to be treated.

EXTRACTION OF CHLOROPHYLL AND ITS USES

Green plants when dried carefully, contain about 2 per cent. of chlorophyll combined with oils, fats, and waxes as well as with phytosterol, a vegetable form of cholesterol. Chlorophyll is soluble in oils, alcohol, and ether, and when either the fixed or volatile oils are extracted from vegetable materials they are often colored green by the dissolved chlorophyll.

According to Dr. E. W. Pearce, writing in the "American Perfumer," the extraction of this green coloring matter from plants is a matter of care and precision, because there is so much danger of the product being contaminated by other materials. The chemically pure substance has been obtained in the form of bluish black crystals having metallic lustre, but the commercial pure grades are generally in the form of dark grass-green pastes, probably representing the compound of chlorophyll and phytosterol. Many grades contain yellowish or brownish waxy matters that lower the value of the product to a considerable extent, hence a colorimetric test is necessary to determine the value of any given sample.

Chlorophyll normally contains magnesium as an essential component, but this may be replaced by other metals to give various other properties. Some varieties have been so modified that they are no longer soluble in oil and alcohol, but are soluble in water, without a loss in any of the original properties.

The principal use of chlorophyll as a color is in the oil, soap, and perfumery trade, where a permanent natural green color is desired without the danger of staining, discoloring, or fading, which is a characteristic fault of every available aniline dye. Its use as an accessory color is perfectly logical because it is the very color nature would impart to the product.

The strength of oil soluble chlorophyll may be determined by dissolving a definite weight in pure wood alcohol or benzol and comparing it in a glass cylinder with a standard. By diluting the stronger solution until the two match in shade, the strength of the samples is inversely as the volume of the solutions. For the water soluble varieties the same method is used, substituting distilled water for the alcohol.

COAL MINE FATALITIES IN U.S. 1920

According to reports received by the U. S. Bureau of Mines 2,260 men were killed by accidents at coal mines in the United States during the year 1920. This is a decrease of 57 fatalities from the record of 1919, and the report of the Bureau states that this decrease is particularly gratifying because it was accompanied by an increase of more than 18 per cent. in the output of coal, showing that the efforts of the Bureau in introducing safety measures in operations and in instructing the workmen to be more cautious and careful in their work is proving effective. There were approximately 775,000 men employed in the U. S. coal mines during 1920. There was a decrease of 64 per cent. in fatalities due to mine fires, 38 per cent. in fatal accidents caused by explosives, and 14 per cent. in deaths from explosions of gas and coal dust. An increase of 10 per cent. is noted in underground accidents due to electricity, 6 per cent. in fatalities caused by underground haulage systems, and 2.5 per cent. in deaths caused by falls of roof and coal.

ENGLISH AND AMERICAN ELECTRIC FURNACES

Reference is made to a paper by Mr. D. F. Campbell, describing recent developments in the electric furnace in Great Britain, and the chief points are recapitulated, followed by a consideration of recent American practice and a description of furnaces.

In English practice it is not considered advisable to employ furnaces of greater capacity than 25 tons and 3,000 k.w. The general tendency of American design is towards the exclusive use of arc type furnaces, and the costs of treatment have been lowered by the use of larger furnaces and the employment of improved devices for charging and discharging and automatic installations for regulating the power factor. The system of electrode and current controllers is described. Copper and bronze electrode holders and coolers have been eliminated in favor of steel on account of their lower cost, and to avoid copper contamination of the bath. Detailed descriptions are given of a 30-cwt. Booth-Hall and a 10-ton Girod furnace, a reversion to the circular form having been made in the latter, as this shape gives better thermal efficiency, and requires only three electrodes in place of four. (John B. C. Kershaw, F.I.C., "Foundry Trade Journal," Jan. 6, 1921. 5¾ cols., 2 figs.)—(From TECHNICAL REVIEW, London, England.)

The Late Emerson Bristol Biggar

EMERSON B. BIGGAR founded the Canadian Chemical Journal, now known as Canadian Chemistry and Metallurgy, publishing the first issue in May, 1917. At sixty-seven years of age he had accomplished a very full lifetime's work as a publisher and author. For a few months previous to his death at Toronto on Tuesday, May 31st, he had not been in good health, but had continued his work of special contributor to a number of papers. Believing that the chemists of Canada have some considerable interest in the career of one, who, although he was unknown to them professionally, was instrumental in establishing the first paper of any kind in their special interests, a short historical account of his various activities is presented.

Mr. Biggar was born on his father's farm near Winona, Ontario, on March 6, 1853. He received his early education in that locality and for one year taught public school. His first newspaper connection was with "The Hamilton Standard." He was later Assistant Editor of "The Hamilton Spectator." In 1875 he went to South Africa where he remained five years. During that time he was connected with various papers in Cape Colony, including the "Cape Argus." He returned to Canada in 1880, and in 1883 started the "Dominion Dry Goods Report." the first paper for this trade in Canada. His interest in the textile trade in general dates from this time, and the present "Canadian Textile Journal" is a direct outcome. In 1886 Mr. Biggar established "The Canadian Exhibitor," a paper published in England to support Canadian export business. Its specific function was to represent Canadian interests in London at the time of the Colonial and Indian Exhibition.

In 1893 he established "The Canadian Engineer," which was the first engineering paper of any kind to be published in Canada. Following in succession came such papers as "The Canadian Woodworker;" "Canadian Pulp and Paper Magazine;" "Canadian Miller." In connection with the Pulp and Paper Magazine he has often told the writer incidents of early days in this Canadian industry. The vision or faith which he had in the industrial developments of Canadian resources was amazing. This paper was started when paper mills were not so thick as they are now, and, as Mr. Biggar said "when there were not more than thirty possible subscribers in the whole of Canada."

His original writings were continued at all times, and include:

(1) A History of the Life of Sir John Macdonald.
(2) A sketch of the Battle of Stoney Creek.
(3) Longevity in the Maritime Provinces.
(4) A History of Canadian Journalism.
(5) The Beginnings of Bathurst (N.B.)
(6) The Canadian Railway Problem.
(7) The History of Hydro-Electric Developments in Ontario. (1920).

His only political venture seems to have been in 1911 when he strongly opposed reciprocity from various platforms. He was a regular contributor to the American and English press, and at different times has written special articles for most Canadian magazines and leading papers.

This then was the man who in 1917 as a direct result of the new public appreciation of the function of the chemist in times of war and peace, conceived the idea of a chemical paper in Canada. The idea was very original with him, as at that time his knowledge of foreign chemical literature was most limited. Mr. Biggar was, however, in a position where he could devote his entire personal time to the matter, and in spite of many difficulties, proceeded to create the paper. By doing so, he at once made a place for himself in the chemical historical records of the Dominion. The early issues were almost completely his personal work, and whatever value the paper may have to Canadian industries and the profession of chemistry in future, it may safely be said that his enthusiastic conception of the idea probably established the paper several years in advance of the time, when either chemists would have done anything for themselves, or other publishers would have made such a move. Mr. Biggar was not slow to grasp the full significance of industrial chemistry in the life of the nation, and viewed in perspective it is not remarkable that this field should have been

The late Emerson B. Biggar.

his at the end of a lifetime in the publishing field. In Applied Chemistry he saw the fundamentals of all the industries he had served through the press, and through the special industrial papers he had been instrumental in establishing previously. With him, publishing was a series of researches, and in chemical language he was undoubtedly one of the foremost research publishers and creators we have had in Canadian journalism to date.

MADAME CURIE HONORED IN AMERICA

Madame Curie, the distinguished French woman scientist during her recent visit to America was the recipient of many honors from leading scientific bodies. Perhaps the highest honor bestowed on Madame Curie was the Degree of Doctor of Science from Columbia University, New York. Unfortunately, Madame Curie was not able to include Canadian points in her trip, other than a short stop at Niagara Falls, where representatives of the Women's Council of the University of Toronto presented her with an address.

WESTERN POTTERY INDUSTRY ENCOURAGED

A pottery company at Medicine Hat, Alberta, has received an order from the Canadian Pacific Railway for a large supply of teapots for use in the company's dining cars and hotels.

Principles of Leaching and Precipitation of Copper*

By FRANK E. LATHE.†

THE conspicuous achievements of oil flotation have quite relegated leaching to the background, at least for the time being. The chief reason why flotation made such rapid progress in comparison with leaching is, that the former fits in well with ordinary gravity concentration, in fact, helps it out where it is weakest, in the treatment of slimes.

There were six principle leaching plants in operation in America during 1920. These were most widely separated as follows:

No.	Company	Location	Tons Daily Capacity	Material Treated	Chief Copper Minerals	Preliminary Treatment	Solvent	Precipitant
1	Anaconda	Anaconda, Montana	2,000	Tailing (sand)	Chalcocite, chalcopyrite, enargite, bornite	Roasting	Sulphuric acid	Scrap Iron
2	Calumet and Hecla	Lake Linden, Michigan	4,000	Tailing	Native copper	Crushing to 28 mesh, and desliming	Ammonium carbonate	Heat
3	Chile Exploration	Chuquicamata, Chile.	15,000	Ore	Brochantite chalcanthite, natrochalcite	Crushing to half inch	Sulphuric acid	Electrolysis
4	Kennecott	Kennecott, Alaska	700	Tailing	Malachite, azurite	Partial desliming	Ammonium hydrate	Heat
5	New Cornelia	Ajo, Arizona	5,000	Ore	Malachite, cuprite, chrysocolla	Crushing to half inch	Sulphuric acid	Electrolysis and scrap iron
6	Utah Copper	Garfield, Utah	2,000	Ore	Malachite, azurite	Crushing to half inch	Sulphuric acid	Scrap iron

The operations through which the ore may be passed are discussed.

Crushing.

For heap leaching where the operation may require a year or two, pieces of several inches in diameter are satisfactory. For tank leaching the size of particles is most important.

There are advantages and disadvantages to fine crushing. Fine crushing sets free the copper minerals, and generally increases the capacity of the plant by shortening the time of solution. If the usual solvent sulphuric acid is used, the amount necessary will be less. If pieces are large a greater loss arises through action on the gangue. The disadvantages of crushing are the expense and the excessive dust, as crushing is carried out on dry materials. The dust losses are considerable as the fines are usually richer in ore. Slimes leach very poorly unless they are agitated, which is not done commercially. Extraction is usually best on fine sands. Channeling in tanks is troublesome even on coarser sizes, and on finely ground material a greater loss exists in water soluble copper.

The fineness of the crushing depends on the nature of the ore. If the copper is in cracks and joint planes, larger sizes may be leached. The horizontal Symons disc crusher is favored for intermediate work, while rolls and vertical Symons are also used. At Calumet and Hecla pebble mills are used for fine grinding.

Desliming.

If half inch ore is being leached, no desliming is required before sulphuric acid leaching. The Anaconda plant obtains good percolation, because tailings contain no great amount of slimes. The feed is partially deslimed at Kennecott, and more completely at Lake Linden, where minus-200 mesh material is carried off in the V-shaped settling tanks.

Roasting.

Some operators claim that a roasted ore is not economical. The Anaconda Company are, however, roasting tailings with 3.3 % coal and making a profit on materials as low as 0.5 % copper. When roasting is used as a preparation for leaching, the process may become a serious competitor of flotation. Canada has not any considerable deposits of oxidized copper, and this work has a bearing on her prospects as a producer of leached copper. Roasting increases the solubility of the copper and decreases that of the gangue and agglomerates the fine particles allowing better percolation. In the process arsenic and antimony may be partially volatilized. Temperature control is essential as at about 550° C sulphates of iron go to trioxide of sulphur and iron oxide, while copper sulphate is not decomposed. At 650°-700° C copper sulphate is decomposed. Salt may be added, making a soluble chloride, and is very useful in presence of gold and silver. Anaconda is the only large scale plant roasting ore. The roasting is done in six-hearth modified McDougall furnaces, twenty feet in diameter, fired with coal on the third hearth. The temperature here is 535° C. Sulphur in the feed is a little over 2 %, and is reduced to about half of one per cent., a part of which is soluble. Each furnace has a capacity of seventy-five tons per twenty-four hours.

Solvents.

The ideal solvent for large commercial operations has not been found. About 75 % of all leaching is done with sulphuric acid, as it offers most advantages. The chief of these are, cheapness, easy regeneration by electrolysis of copper bearing solutions, gives a pure copper, and is non-volatile. Its disadvantages are that it does not dissolve metallic copper, and only one-half of the copper from cuprite. It attacks the carbonates of iron, causing contamination and losses of acid. It also gives some trouble with aluminum compounds. Ammonia and ammonium carbonate are being used at the two modern plants, the Calumet and Hecla and the Kennecott. It is expensive, volatile, cannot be regenerated, and does not give a pure

*Abstract of paper before Canadian Institute of Mining and Metallurgy, Montreal (Spring Meeting) 1921.

†Chief Chemist, British America Nickel Corporation, Deschenes, Que.

copper from ammoniacal solutions. It does dissolve metallic copper and cuprite and does not attack carbonates, iron and alumina.

Sulphurous acid and ferric salts have been considered as solvents, but they are not likely to displace other methods. Where copper is precipitated by scrap iron they are most useful.

Solution of Copper by Sulphuric Acid.

When fine and uniform material is leached, no great amount of attention need be given to distribution of the charge in the tanks. When the size varies from one inch to a slime, channels occur. The large tanks are usually rectangular and spanned by loading bridges carrying conveyor belts. Tanks are 10 to 15 feet deep. The circulation of solutions is something specific for each plant, and different engineering principles are used. As many as seven solutions of different composition are used and obtained in plant of Chile Exploration Company, all part of a continuous process. Percolation may be up or down, continuous or intermittent for various reasons.

Where iron precipitation is used, all acid is lost. Amount per ton may be from ninety to a few pounds, depending on nature of gangue and acid in the ore. Ferric iron is mostly responsible for failures in electrolytic work. It may be removed by precipitation with copper oxide or it may be reduced by sulphur dioxide. Chlorine may be precipitated by cement copper as cuprous chloride.

Precipitation of Copper by Electrolysis.

Graphite or carbon in some form has been urged, but is used only in chlorine solutions. Sulphate solutions attack it unless an oxidizing agent like Sulphur Dioxide is present. Ferric Salts corrode it. The voltage used is low, and acid regenerated high. Lead up to 10% antimony is good for sulphate solutions, except in chlorine. Ferro Silicon anodes are used at Chuquicomata with success in presence of acids, both sulphuric and hydrochloric. This is somewhat soluble and must be discarded because of loss of iron. The electrolyte used is lower in acid and higher in impurities than that employed in regular work. Ferrous iron causes trouble, as it may be oxidized. Chlorine up to 0.5 grams per litre and nitric acid up to 15 grams per litre may do little harm. With trained men a current efficiency of 80 to 85% is obtainable.

Precipitation of Copper on Scrap Iron.

In small plants and where iron is cheap this is used. Sponge iron would be ideal, but old cans may be used. Most of the copper is precipitated in modified tube mills filled with scrap iron and goes to launders for final precipitation. Cement copper runs about 65 to 70% Cu.

In ammonia leaching mechanical difficulties in handling the solvent are considerable, but the general washing methods are the same as with acid. Ammonium Carbonate is oxidized in presence of air, and copper to cupric-ammonium carbonate which in turn dissolves more copper producing cuprous-ammonium carbonate $CuCO_3\ (NH_3)2$ Air is passed through the first and second leach solutions. Any ammonia gas carried off is absorbed in water. Ammonia and carbon dioxide are recombined after heating. In practice about one pound per ton of ammonia is lost. The leaching plant at Lake Linden is stated to have made 11,000,000 pounds of copper, costing less than six cents a pound up to smelting. The recovery was over 80%.

S. Wander & Sons' Chemical Co. announce their removal to 59 Crosby St., New York City, where they will have their own warehouse facilities for heavy chemicals.

Chemical Society News

Paris, April 27th, 1921.

The Secretary Canadian Institute of Chemistry:

Dear Sir:

We ask you to notify the members of your society that our committee has been able to undertake the publication of the annual tables. The enclosed prospectus indicates the conditions of subscription. We have made the prices as moderate as possible in order to facilitate the circulation of the Tables, which price does not represent the actual commercial value.

The more to take into account the distinguished patronage of the Union of Chemistry Pure and Applied, we have decided that the members of all the affiliated societies shall benefit under the same conditions that we made before 1914 only to the contributing societies.

We ask you to help us to make known our publications by inserting in your next issue the enclosed prospectus.

Thanking you in advance for your co-operation,

We beg to remain

For the Committee,

The Secretary General, C. MARIE,

9 Rue de Bagneux, Paris.

"Tables of Constants and Numerical Data of Chemistry, Physics and Technology."

Published under the patronage of the International Union of Chemistry Pure and Applied.

M. Charles Marie, Secretary General of the International Committee of Annual Tables of Constants and Numerical Data of Chemistry, Physics and Technology, notifies us that this important publication has been completed and the fourth volume containing the numerical data of the years 1913 to 1916 inclusive will appear this year. This volume will be divided into two parts having between them 600 pages, and the first part, which includes from "Compressibility" to "Rotary Powers" will appear about June or July next.

The members of the Society will benefit by an important reduction on the subscription prices which have been fixed by the Committee as follows:—

1st Part—Unbound 100 francs, bound 120 francs. The volume complete, unbound 200 francs, bound 240 francs.

The prices to the members of the Society will be reduced to 1st Part—Unbound 75 francs, bound 90 francs. The volume complete, unbound 150 francs, bound 180 francs.

The subscriptions must be sent in before July 31st, 1921, to the Secretary General of the Committee, M. Ch. Marie, 9 Rue de Bagneux, Paris.

The Committee has decided in addition that those subscribers who pay cash with their order will receive the volumes prepaid. Payment should be made either by money order, or cheque payable to M. Ch. Marie.

The secretary general of the Committee is at the disposition of the members of the Society who desire further information.

Table of Contents—Part I.

The part comprises the following chapters (the names in brackets are those of the authors):—Co-efficients of Compressibility—Elasticity (A. W. Porter); Density-Viscosity (N. P. Appleby); Superficial Tension (F. Michaud); Co-efficients of Dilation (A. W. Porter); Specific Heats—Thermal Conductivity (Mlle. L. Bidet); Thermodynamics (A. W. Porter); Fusion Points (F. Meyer); Vapor Tensions—Laws of Gases (Van Laar); Acoustics, Photometry, Radiation, Infra Red Spectrum (Mlle. L. Bidet); Coefficients of Absorption—Refraction and Dispersion (Vaurabourg); Spectroscopy (Bruninghaus); Rotary Powers (C. E. Brazier).

NEW MEMBERS OF INSTITUTE

The following have been elected to membership in the Canadian Institute of Chemistry:

Fellowship—John Hayes Jenkinson, 20 Herrick St., Sault Ste. Marie, Ont.

Associateship—Paul Larose, 212 Prud'homme Ave., Montreal Que.

CANADIAN INSTITUTE, ELECTION OF OFFICERS

As a result of the ballot re extension of officers of the Canadian Institute of Chemistry, 160 votes were received in favor of extending the term of the present officers of the Institute for one year, to conform with legal incorporation requirements, and one vote to the contrary; as a result, there will be no election this Spring.

FURTHER ARRANGEMENTS REGARDING PROGRAM OF ANNUAL MEETING, SOCIETY OF CHEMICAL INDUSTRY, AND VISITS TO CANADIAN AND AMERICAN POINTS

In addition to details announced in June issue, the Montreal Committee have issued the following data on hotel reservations and rates.

A general reservation has been made at the Windsor Hotel, Montreal, where rates are:—Single rooms, with bath, $4.50; double room, $7.50. A special train will accommodate visitors from Montreal to Toronto, by way of Shawinigan Falls and Ottawa. Hotel accommodation being at a premium during Exhibition weeks at Toronto, arrangements will be made with the University of Toronto for the use of the University residences.

The estimated cost of the trip to the United States border, from Montreal, including the following items, amounts to $67.20.

Railway Fares:	
Montreal to Shawinigan and return	$ 6.85
Montreal to Toronto, via Ottawa	13.45
Toronto to Niagara, by boat	3.30
Sleeping Car Fares:	
Montreal to Shawinigan	3.00
Shawinigan to Ottawa	3.30
Ottawa to Toronto	3.30
Hotel, Montreal, 4 days	18.00
Meals at Montreal and on trip	16.00
	$67.20

United States Program

In connection with the visit at New York, attention is invited to the accommodations which can be provided in the Residence Halls of Columbia University, through the courtesy of the Trustees. These accommodations available are as follows:

For 400 single men in Hartley and Livingston Halls; for 300 single women in Furnald Hall; for 100 married couples in Claremont Apartments, or in Brooks Hall. The rate of charges will be $10.00 per person for ten days (September 6th to 16th); for shorter periods, one to six days, the rate will be $1.50 per person per day.

An excellent cafeteria is in the University Commons nearby and the guests may expect satisfactory meals at very reasonable cost. Bills for University accommodations will be rendered by, and payments must be made to the Hotel Committee, because the University cannot bill visitors or receive payments from them.

Single rooms at New York hotels cost from $3.00 to $6.00 per day, and double rooms from $5.00 to $12.00 per day, and cost of meals at these hotels is in proportion.

Arrangements have also been made for guest privileges from September 6th to 18th, at sufficient Golf Clubs to accommodate all who desire to use them.

It is believed that necessary expenses in the United States need not exceed $75, as follows, viz.: Railroad fare $12; Room at Columbia University, $10; Meals at Columbia University, $20; Tram fares and incidentals, $32. The sleeping cars and the boat trip from Albany to New York, as well as cards to Banquet and Exposition are complimentary to our guests from overseas.

Monday, September 5th—The morning will be spent visiting hydro developments on the Canadian side. Foreign guests will be met by a Committee from the American Section and conducted through industries on the American Side of the Falls. Luncheon at the Falls. Dinner at Buffalo. Special train of Sleeping Cars to Syracuse, N.Y.

Tuesday, September 6th—The Solvay Process Company, Syracuse, N.Y., will entertain at luncheon and a tour through the great factory. Luggage will be left on the train which will not depart until mid-afternoon and will proceed to Albany, where we will take the night boat down the Hudson River to New York.

Wednesday, September 7th—New York, 1.00 p.m., Luncheon by the American Section to Foreign guests. 4.00 p.m., Reception and tea to Foreign guests, and to Scientific Societies, at Columbia University. 8.00 p.m., Smoker and Entertainment of American Chemical Society. Foreign guests invited.

Thursday, September 8th—The usual general, divisional, and sectional meetings of the American Chemical Society, to which all foreign guests are cordially invited.

Friday, September 9th—The usual general, divisional, and sectional meetings of the American Chemical Society, to which all foreign guests are cordially invited. 7 p.m., Banquet of American Chemical Society. Foreign guests welcome.

Saturday, September 10th—Golf and tea.

Sunday, September 11th—Boat trip and tea.

September 12th to Saturday, September 18th—The National Exposition of Chemical Industries.

SHAWINIGAN FALLS SECTION, SOCIETY OF CHEMICAL INDUSTRY

The Shawinigan Falls Section of the Society of Chemical Industry was addressed on May 25th, on the subject of "Rubber" by Dr. G. S. Whitby, Assistant Professor of Chemistry, McGill University.

At the outset the lecturer drew attention to the rapid growth which the rubber industry had experienced during the decade 1909-19; the total production of raw rubber having increased about six-fold. The increase was accounted for by a growth in the production of plantation rubber from about 3,000 to about 300,000 tons per annum. The procedures by which plantation rubber is prepared were outlined. Special attention was drawn to the important influence on vulcanization of the small amount —about 5% in all—of non-caoutchouc substances present in the raw rubber. The influence of the resin was particularly marked when the rubber was compounded with litharge. Reference was made to the investigations now being conducted at McGill on the chemical nature of the rubber "resins."

With the aid of lantern slides, the processes employed in the making-up and vulcanization of rubber articles were outlined. The influence of the chief compounding ingredients was considered; the growing importance of organic accelerators of vulcanization being mentioned. Data were given showing that such accelerators may not only increase the speed of vulcanization, but that they may also confer improved physical properties on the vulcanizates, and further, that different accelerators may exercise favorable effects in different directions; e.g., one improving tenacity while another improves extensibility. Mention was made of the systematic work of Wiegand on the influence of inorganic compounding ingredients.

The uniqueness of the mechanical properties of vulcanized rubber was brought out by consideration of the stress-strain curve; of the magnitude and character of hysteresis and elastic after-effects in rubber; and of the relation between thermal and tensile effects. A number of experiments in illustration of these effects were shown.

PAPER TECHNOLOGISTS SEE REMARKABLE GROWTH IN SAINT MAURICE VALLEY

The Technical Section of the Canadian Pulp and Paper Association held its summer meeting June fourteenth to seventeenth in the Saint Maurice Valley, giving one day each to Three Rivers, Grand Mere and Shawinigan.

In 1895, Three Rivers was a sleepy, lumbering city of scarcely ten thousand people, apparently sinking. It had several large lumber mills, a decadent foundry and an appropriate coffin factory. The paper-mill men found it a thriving city of over twenty thousand, with three large pulp and paper mills, and a fourth approaching completion. The last is to be one of the biggest news mills with four 164-inch fourdrinier machines, and equipped with oil fired boilers, which will use, when completed, six thousand gallons of oil daily, under two batteries of four Babcock and Wilcox boilers. There are two shipbuilding yards, a large cotton mill, a pipe foundry and a number of minor industries. In one of the shipyards, five huge Lancashire boilers and three sets of engines for ocean freighters were nearing completion. Three Rivers is well paved, and has an adequate street railway system. The fire department was called out by an alarm rung in by Mr. Wilson, President of the C. P. and P. A., responding in one minute and thirty seconds with four pieces of apparatus. The city has port facilities for ocean steamers—the paper-mills shipping direct in steamers for South America and Australia.

Grand Mere was the next point visited. In the early nineties, the writer lived in Grand Mere. There were then eight houses on a bluff, and three or four below, with a store, school and office, in addition to a groundwood pulp-mill. To-day Grand Mere is a town of over five thousand people, has groundwood and sulphite pulp-mills and large news print mills. It is paved, and is laid out on the best town planning lines with train service, several times daily on two railroads. There are excellent schools, including high school. The visitors spent the morning in the huge mills and power stations. Nearly two hundred thousand horse-power is developed here; a portion being used for operation of street-cars in Montreal. Also, we visited an important forest nursery a few miles up the river. The residential part of Grand Mere is under control of the Laurentide Company, and for houses, shrubbery and treatment vies with the best of our large cities.

Thence we proceeded to Shawinigan, and again a wonderful development was evidenced. One hundred eighty thousand horse-power with means for increasing to about two hundred fifty thousand makes this town a hydro-electric centre. In contrast to Grand Mere, which is a one-industry town, Shawinigan has in addition to pulp and paper mills, electro-metallurgical works, making aluminium, magnesium, ferro-silicon and special alloys, a foundry and carbide works. Large blocks of power are sent to Three Rivers, Quebec and Montreal, in co-operation with Grand Mere. In the nineties, a trip to Grand Mere from Three Rivers entailed a start about five in the morning, and, with good luck, arrival at Lac a la Tortue about noon, driving three miles, and ferrying across the river. Shawinigan was twelve miles from the railway. Now one can leave Three Rivers several times in the day and make Shawinigan in forty minutes, with Grand Mere fifteen minutes beyond. About half-way between Shawinigan and Three Rivers, there is another two hundred thousand horse-power at Gres Falls.

The Honorable Jacques Bureau, addressing the visitors at a luncheon tendered by the city of Three Rivers, referred to that city and the Saint Maurice as the Hub of Canada. No better illustration of Canada's growing powers can be made than this tremendous twenty-five year old development. Further indication of growth and possibilities lies, as well, in the fact that the Saint Maurice valley has a full-fledged section of the Society of Chemical Industry, which makes its headquarters at Shawinigan.

BOOK REVIEWS

"THE CHEMICAL EFFECTS OF ALPHA PARTICLES AND ELECTRONS"

By Samuel C. Lind. American Chemical Society Monograph Series. 171 pp. Chemical Catalog Co., New York, $3.50.

This is the second volume of a series, being put out by the American Chemical Society as a contribution to the chemical book literature of the United States. The fields chosen are those where it is believed a book synopsis of the literature will be most valuable. The material gathered in this monograph constitutes a division of the general subject of radio-chemistry, as briefly defined by the author. The chemical viewpoint is maintained and emphasis given to relations between chemical effects of the material and of the photo-chemical radiations.

Following a brief outline of radio-activity and some properties of radiations, some qualitative radio-chemical effects are discussed. Among these are coloration, decompositions, thermoluminiscence. Under quantitative investigations, the work done on the decomposition of water by radium salts is given. Considerable space is devoted to gaseous ionization and radiochemical effects, as well as the Kinetics of the chemical reactions produced by radium emanations.

The editor and the Society acting in the production of this book are to be congratulated on the high type of work appearing in the series to date.

"THE ELECTRON CONCEPTION OF VALENCE AND THE CONSTITUTION OF BENZENE"

By Henry S. Fry, Longmans, Green & Co., 297 pp., price, $5.00, U.S.A.

The author's consideration of his subject is divided in four main sections:—

1. The electronic conception of positive and negative Valence is developed as a formulative hypothesis in chemistry.
2. A consideration of the constitution of benzene and its derivatives, along with the problem of substitution in the benzene ring.
3. The questions of physical and physico-chemical properties, molecular volumes, absorption of light and fluorescence
4. The constitution of the metal-ammines and a bibliographical review of articles by authors who have presented applications of the electronic conception of valence.

In these sections, the specific cases or material used as subject matter for discussion is reduced to such limits as will allow for some clarity in deductions. A real effort is made to actually see the "wood" rather than the "trees." While the original literature on the subject is voluminous, this author has contributed something of merit in book form, which always tends to broaden out the spread of recent knowledge.

While the book would usually be considered a contribution in the organic field, it is classed as part of a series on inorganic and physical chemistry. If this indicates anything, it points out that beyond superficial divisions of chemistry lie common fundamentals.

"A French-English Dictionary for Chemists"

By A. M. Patterson. John Wiley & Sons, Inc., New York. Price, $3.00, U.S.A.

This is a companion book to Patterson's German-English Dictionary. The first book was about everything that could be desired in contents and pleasing make-up. This is the same size and has about 30,000 words, covering the entire chemical field and much besides.

There is no doubt but that the book will be very well received. Anything designed to direct chemists to modern French chemical literature is valuable.

PERSONALS

Under the charge of Dr. J. B. Porter of McGill University a number of mining students from McGill have been engaged observing mining methods at the iron mines on the Marquette Range, Michigan.

Professor of Geology M. B. Baker, Queen's University, Kingston, Ont., will spend the summer months at field work in Leeds County, Ontario, for the Ontario Department of Mines.

Dr. A. Grant Lochhead, Ph. D., formerly bacteriologist-chemist with the Canadian Milk Products, Ltd., Toronto, has recently accepted a position with the Malt Products Co. of Canada, Ltd.— as chief chemist. Dr. Lochhead will be located at Guelph, Ont.

Mr. Victor van der Linde, jr., of the Van der Linde Rubber Company, Ltd., Toronto, is at present on a six weeks' business trip to England.

DEPRESSION IN MINERAL INDUSTRY SHOWS SIGNS OF LIFTING.

The depression which has prevailed over the mineral industry shows signs of gradually lifting. The whole industry, with the exception of gold mining, has suffered depression and a general lowering of values in common with most other industries. A bulletin issued June 13, 1921, by the Ontario Department of Mines, states in part: The nickel-copper and silver producers in particular have been affected—the former owing to lack of a market and the latter because of the prevailing low price of silver. Hydro-Electric power shortage, as a result of unusually low water during the fall and winter months, had the effect of seriously curtailing the output of gold and also, to some extent, of silver. The iron and steel trade was very quiet during the early part of the year. More recently, however, there has been a decided improvement. The price of lead shows a marked decline, although the output is considerably in excess of the first quarter of 1920.

Gold.

Although production figures show a decline in gold as compared with the first quarter of 1920, this situation will undoubtedly be reversed for the first half of the year, the falling-off, as explained above, being due to Hydro-Electric power shortage. Since early in April an ample supply of power has been available and the Hollinger mine is treating 3,300 tons of ore daily.

In addition, 43 ounces of gold worth $862 were recovered from nickel-copper refining operations. Gold mining companies received, further, a total of $331,356 by way of exchange premium, or as earnings on credit balances in the United States. Gold shipments go to the Canadian mint and are paid for by cheque on New York. Three mines at Porcupine—Hollinger, Dome and McIntyre, were proproducing, and at Kirkland Lake—Lake Shore, Teck-Hughes and Tough-Oakes. In May the Wright-Hargreaves, at Kirkland Lake, commenced milling operations.

Silver.

Considering the combined disadvantages of power shortage, a decline in the price of silver and the fact that several properties are closed down, the output for the quarter is creditable. The average New York price of silver was 60.5 cents per fine ounce for the period, as compared with $1.30 for the first quarter of 1920. The following ten mines made shipments: Nipissing, Mining Corporation, Coniagas, O'Brien, La Rose, Miller Lake, O'Brien, McKinley-Darragh-Savage, Beaver, Trethewey (Castle) and Bailey. In addition to 2,083,989 ounces shipped by the silver mines, there was a recovery of 19,103 ounces by gold mines, shown in above table, and 2,953 from nickel-copper refining operations. The mines also received payment of $4,809 for 32,531 pounds of cobalt.

During the period, Southern Ontario refineries located at Thorold, Deloro, and Welland recovered 1,073,202 ounces of silver in addition to arsenic, nickel and cobalt in various forms. The market for all these products was poor and in consequence stocks have accumulated. The figures in the table refer to products sold.

Nickel-Copper.

Both the International Nickel Company of Canada and the Mond Nickel Company are operating on a greatly reduced scale from that of the war period. No shipments of nickel-copper matte were made during the period by the Mond Company to its refinery in Wales. Surplus stocks of nickel are gradually being absorbed. The British America Nickel Corporation shut down its smelter on Feb. 26th. A reorganization of the company is probable before work will be resumed. Meantime a small force has been doing some underground development work at the Murray mine. During the period, 153,387 tons of ore were smelted and 7,568 tons of Bessemer matte produced. The latter contained 3,861 tons of nickel and 2,315 tons of copper. Of the total matte product 3,367 tons were shipped to Canadian refineries at Port Colborne and Deschenes and 896 tons to the United States. The two refineries treated 2,554 tons of matte for a recovery of 2,853,512 pounds of nickel and 1,562,150 pounds of blister and ingot copper. The average New York price for electrolytic copper was 12.66 cents per pound for the first quarter of 1921, as compared with 18.93 cents in 1920.

Iron Ore and Pig Iron.

With the exception of a small sample shipment of hematite from the Wallbridge mine, near Madoc, not a ton was shipped from Ontario mines. At the Magpie, 42,198 tons of siderite ore were raised. Both the Magpie mine of the Algoma Steel Corporation and the mine at Sellwood, owned by Moose Mountain, Limited, are idle at the present time.

During the quarter the Algoma Steel Corporation (Sault Ste. Marie) operated three blast furnaces for the production of pig iron, the Steel Company of Canada (Hamilton) two, the Canadian Furnace Company (Port Colborne) and Midland Iron and Steel Company one each. Of a total of 287,769 short tons of ore charged to the furnaces, only 31,597 tons or 11 per cent was of Ontario origin. Of the total output of pig iron, 71,862 tons were used, along with scrap, in the production of 117,824 tons of steel worth $4,593,520.

SUPPLIES OF PURE AND RESEARCH CHEMICALS

Degrees of purity are well-known to the chemist and if anything appreciated by him more keenly than by any other professional scientist or engineer. The Physikolisch-Technisches Reichsanstalt, at Charlottenburg, has undertaken to keep this work up for Germany. They prepare or have prepared metals containing less than 0.01% impurity. They have five grades of impurity. Grade 1 contains up to 10%; Grade 2, from 0.1 to 1%; Grade 3, from 0.01 to 0.1%; Grade 4, from 0.001 to 0.01%, and Grade 5, from 0.0001 to 0.001%.

The Bureau of Standards, at Washington, and such companies as the Kodak Co., of Rochester, are helping to gather and supply research chemicals in America. In England, the refined chemical business is in the hands of an association of manufacturers, banded together to assist in manufacturing and selling.

Mining and Metallurgy in British Columbia

(Special correspondence to "Canadian Chemistry and Metallurgy")

The Consolidated Mining & Smelting continues to push the output from its own mines. Up to the end of the first week in May, 149,177 tons of ore have been received at the smelter, which roughly is 50 per cent. more than was received during the same period of last year, when 98,741 tons was received. Of the total received this year, 147,579 tons has come from the Consolidated company's own mines. J. J. Warren, president of the company announced recently that the average daily production of metals at the Trail smelter during the first three months of this year was: Lead, 70 tons, compared with 27 tons during the same period of last year; zinc 81 tons, compared with 37 tons; and copper 8.4 tons, compared with 8.5 tons last year. The copper plant at Trail is capable of producing 50 tons daily, but at the present time the company has not anything like enough ore to operate its copper plant at capacity.

Cost of Coal

After sitting in open session for two months, the Commission appointed by the Provincial Government to inquire into the cost of producing and marketing coal in British Columbia has concluded its investigations and has submitted its report. The personnel of the Commission consisted of Mr. Alexander Henderson, K.C., Commissioner, Major-General R. G. Edwards Leckie, Mining Engineer, and Mr. A. P. Foster, Accountant. The Commission held sessions at Vancouver, Victoria, and the principal mining centers on Vancouver Island, and evidence was given by the principal mine managers, retailers, and by a large number of consumers. The report is a bulky one, each member of the Commission making a separate report dealing with his particular branch. So far as the mines are concerned, the Commission finds that they are operated well and efficiently, and that the managers and superintendents are conversant with the best modern mining practice. It condemns the operators, however, for refusing to sell coal directly to the consumers, thus placing the latter entirely at the mercy of the retailers. Of the operations of the retailers, the Commission deals somewhat scathingly. It finds that the Dealers' Association fixed uniform prices for the sale of coal, and, apparently, not to meet the requirements of the most efficient among them, but to assure a profit to the least efficient. The evidence conclusively shows, further, that dealers frequently deliver short weight to customers. The Commissioner points out that: "This does not necessarily mean that there is a design to deliver short weight, although in some instances there is evidence of that, but it does show that the consumer suffers from short weight delivery, whether the dealer or carter is at fault." The Commissioner recommends that short-weighting should be suppressed by rigorous prosecution. The Commission finds, too, that transportation costs, whether by rail or by water, are excessive, and it suggests that transportation companies and individuals moving coal in British Columbia should be made to make returns showing the cost of operation.

While the Commission finds that $15 per ton delivered to the customer is an excessive price for lump coal, and never has been justified, still, the pre-war price, on the other hand was too small, and while the price ruled the operating companies lost money. Thus, for example, in 1914 the Canadian Colleries, Limited, accounts show an operating loss of $316,036; in 1915, $378,647; in 1917, $348,222; and in 1918, $102,129; while during the eight months preceding the investigation the company made a profit of $168,814. The Canadian Colleries, of course, is the biggest coal concern operating on Vancouver Island, and originally was capitalized at $25,000,000; last year this capitalization was reduced to $16,027,000. The increased cost of labor and supplies, the exhaustion of the more cheaply mined sections of the coal seams, entailing greater hauling distances and the maintenance of permanent haulage-ways; the necessity of operating companies making a profit instead of a loss; and the increased cost of haulage have all been contributing factors toward the increase in the price of coal.

Western Fuel Corporation

The Canadian Western Fuel Company, which owns large coal areas at Nanaimo, on Vancouver Island, and employs 1,500 men, has been re-organized, and the capitalization of the company has been increased to $5,000,000; the original capital was $1,500,000. The company in future will be known as the Western Fuel Corporation of Canada, Limited, and will be an entirely Canadian concern. Prior to the war the bulk of the stock of the company was owned in SanFrancisco.

Standard Continues Prospecting

The Standard Silver Lead Company held its annual general meeting recently, when W. J. C. Wakefield, of Spokane, was re-elected president, George H. Aylard, of Victoria, vice-president, and Charles Hussey, secretary of the company. It was decided to continue the policy, adopted last year, of examining mines and prospects in the Slocan, with a view to finding aproperty whereby the company's present milling plant may be utilized. The Standard mine appears to be practically exhausted for big scale work, and now is entirely in the hands of lessees. The receipts for the year amounted to $216,609, and the disbursements $143,197. This mine and the Slocan Star, now known as the Silversmith, have been by far the biggest producers in the Slocan district.

At a meeting at New Denver, recently, the No. 98 branch of the International Union of Mine, Mill and Smelter Workers, agreed to accept a reduction of 75 cents per day on all classes of work. This is the second reduction within the past eight months, and makes a total reduction of $1.25, as compared to the wage-scale ruling 12 months ago.

The Bluebell Mine, at Ainsworth, which shipped steadily to Trail through nearly the whole of last year, has been closed. The ore is not sufficiently high grade to allow of shipment to the United States smelters.

Annual Report of Consolidated M. & S. Co.

The Consolidated Mining & Smelting Company of Canada, Limited, has recently issued its annual report for the year ended December 31, 1920. From a mining and metallurgical point the year has been a decidedly successful one, but, like nearly all other base metal mining concerns, the same cannot be said of the financial view point. The directors evidently did not realize the seriousness of the base metal market, and paid the usual quarterly dividends of 2½ per cent. for the first three quarters of the year, whereas the company did not make sufficient profit during the whole year to pay one quarterly dividend. The total profit for the year amounted to $291,395, of which interest on the bonded indebtedness absorbed $251,023, leaving only $40,371 to transfer to profit and loss account. When the inventory was made at the end of the year, based on metal prices for the last day of the year, the immense sum of $624,115 had to be written down for depreciation of metals, ores, and supplies on hand, a stock, as a matter of fact, that is still being carried, as current production has been more than sufficient to meet current demands. The capital expenditures during the year were enormous, reaching the large sum of $1,892,067, the principal items being $698,000 advanced to the West Kootenay Light and Power Company; $260,661 for the concentrating plant for the Rossland ores; $208,912 for enlargement of copper refinery; $127,440 for copper-rod mill; $158,760 for the installation of three Dwight Lloyd sintering furnaces to treat the Canada Copper Corporation's concentrate; $130,704 advance to the Coast Copper Co.; and $72,936 advance to the Sunloch Mines, Limited. These and other expenditures and the pay-

ment of unearned dividends necessitated the company increasing its borrowing to the extent of $2,283,769.

The mining and metallurgical end of the business is a brighter page. Further important discoveries were made at the Sullivan mine, at Kimberley. An extension of the workings on the No. 11 level has found a large body of ore, running high in zinc and well in lead. Diamond drilling on the bottom level has proved the continuation at depth of the high-grade zinc-lead ore-body that has been so profitable in the upper workings of the mine.

Great improvement has been made in the method of concentrating the Sullivan mine ore, resulting in lead and zinc concentrates that are more amendable to subsequent treatment. Considerable improvement, too, has been made in the electrolytic zinc process, resulting in higher extraction and reduced cost. Improvement, also, has been made in the electrolytic refining of lead bullion, again resulting in higher extraction and reduced cost. The copper appears to be the only section to mar the metallurgical record of excellence. Owing to a shortage of ore, to the remodelling of the plant, and finally to the slump in the price of the metal, the copper plant of necessity had to be run intermittantly, resulting in increased cost.

The report deals too much in generalities and far too little in exact detail. No details of cost or of extraction are given, consequently the reader has to work that out for himself and draw conclusions that may be entirely erroneous. During the year 592,763 tons of ore and concentrate were received at the smelter, and the following quantities of metals were produced: 42,636 ounces of gold, 1,097,930 ounces of silver, 26,474,652 pounds of lead, 36,995,394 pounds of zinc, and 4,501,594 pounds of copper. The output from the Company's Rossland mines amounted to 50,841 tons of ore and 3,683 tons of concentrate, and the output from the Sullivan was 242,294 tons of zinc-lead ore and 13,214 tons of lead ore. The company was operating under unusual difficulties; G. S. Blaylock, the general manager, estimates that, compared with the pre-war days the cost of labor was 30 per cent. higher, coal and coke 100 per cent. higher, freight-rates nearly 50 per cent. higher, and other supplies from 40 to 110 per cent. higher; while the prices received for metals were below those of before the war.

Granby Annual Meeting

The Granby Consolidated Mining, Smelting & Power Company held its annual general meeting recently. Common with nearly all other copper companies on the continent, the year has been an unprofitable one, showing a deficit of $687,001, compared with a deficit of $984,409 during 1919. There is this marked difference in the two years, however, no dividends were paid last year, while in 1919 $1,312,537 was disbursed in dividends. There has been a reduction in assets from $25,081,361 at the end of 1919 to $24,906,360 at the end of 1920, while during the same period the surplus has been reduced from $1,184,309 to $497,298. During last year the company produced 25,744,327 lb. of copper, 1,054,206 oz. of silver, and 9,481 oz. of gold. About 90 per cent. of the silver was obtained from ore purchased from the Taylor Mining Co., and came from the Dolly Varden mine. The production of copper cost on an average 15.94 cents per pound, and 19,464,796 lb. was sold at an average price of 17.85 cents per pound. Considerable economies were made after the management of the company was changed, the cost of production of copper for the first half of the year being 18.38 cents and this was reduced to 14.01 during the second half. Two cuts have been made in the wage scale since the commencement of the present year, and, during the month of March the company was producing copper at 12.44 cents per pound.

A. J. Bancroft, professor of geology at McGill University has taken up his duties as assistant manager for the Granby company, succeeding E. E. Campbell, who now is superintendent of the United Verde Extension, in Arizona.

Experimenting on Magnetite Ore

The Hon. William Sloan, Minister of Mines, has announced that his department is taking out 20 tons of magnetite from the Lake Hill mines, on the west coast of Texada Island, for shipment to Thomas Summerson & Sons, of Darlington, England, for experimental purposes. The ore will be smelted in the company's electric furnace, and arrangements have been made with Percy S. Leggatt, of the Summerson firm to advise the Government as to the behavior of the ore under commercial conditions. W. M. Brewer, resident mining engineer for the No. 6 district, is superintending the extraction of the ore. He states that it will average 58 per cent. of iron, and will carry practically no impurities other that silica and lime. Such an ore should offer no metallurgical difficulties.

The Hedley Gold Mining Company has re-opened its Nickel Plate mine, at Hedley. This mine, which in the past has paid its shareholders more than $2,500,000 in dividends, was closed last fall on account of the unsatisfactory labor conditions. These have now greatly improved, the wage-scale having been reduced by $1.25 per day for all classes of labor.

Standard Mine Sold

Subject to ratification by the shareholders, the directors of the Standard Silver Lead Mining Company announce that the Standard mine, at Silverton, has been sold for $75,000. The Standard company is in a strong financial position, having a surplus on hand of some $450,000, which is being held for investment in mining property. The Standard mine has been in the hands of lessees for some time, the directors considering that for big-scale operations the mine is worked out. This may or may not be so. It is not so long ago that the Slocan Star was said to be worked out, but to-day, under the changed name of the Silversmith, it has by far the largest ore reserve of any mine in the Slocan. The Standard has been a splendid property, and has paid its shareholders more than two and a half million dollars in dividends.

Mining Notes

The Le Roi No. 2 mine at Rossland, which was closed at the beginning of last November, has been re-opened under the management of Douglas Lay, who recently arrived from England for that purpose. Mr. Lay at one time was in charge of the Van Roi mine, at Silverton. Mr. Lay states that a concentrating plant has been ordered and will be erected as soon as it arrives.

The Ingenika Gold Mining Company has shipped a considerable quantity of placer mining machinery to the Ingenika river, a tributary of the Peace River, and proposes to operate on an extensive scale during the coming season.

The Hellsgate Mining Company has been formed at Ashcroft to operate the dry-placer deposits that were discovered recently near Spence's Bridge.

The Peace River Petroleum Company, Limited, which owns 48,000 acres of oil leases in the Peace River block, has made arrangements to sink a bore-hole about three miles west of Hudson Hope. It is probable that a second drilling outfit will be employed later in the season.

The Queen mine, at Sheep Creek, which was purchased recently by a Spokane syndicate, is being re-opened.

The Consolidated Homestake Mining & Development Co. has been organized at Vancouver to purchase and operate the Homestake group, at the head of the Kitsault River, Alice Arm district.

The Mountain Chief Mining Company has been re-organized, and its capitalization increased from $500,000 to $600,000. The Mountain Chief mine, which is situated at Realta, shipped copper ore steadily to Trail last year.

The Providence mine, at Greenwood, which shipped a quantity of high-grade gold-copper ore to Trail last year, has been re-opened. It was closed last fall.

The annual report of the Belmont-Surf Inlet Mines, Limited, for the year ended December 31, 1920, shows that the concentrate shipped to Tacoma during 1920 realized $866,929, and resulted in a net profit of $212,103.

Eastern capitalists have taken a lease and bond on the Fox Talc mine, at Vermillion River, eleven miles from Castle station on the C.P.R. There is a 30-foot deposit of talc on the property, which is said to grind to a white powder, free from grit.

The Gamble Placer Mining Company has started washing operations at its mine at Wild Horse Creek, near Cranbrook. The company acquired fresh water-rights during the winter, and expended $20,000 in flumes to convey the water to the property.

In the case of Stewart v. the Molybdenum Mining & Reduction Co., recently tried before the Cort of Appeal, at Victoria, the decision of Chief Justice Hunter in the Supreme Court, giving title of the Conundrum mine, at Alice Arm, to the Molybdenum company, was reversed.

New Mineral Discovered in British Columbia

What is believed to be a new mineral, which provisionally has been named "camsellite," after the present Deputy Minister of Mines, Mr. Charles Camsell, has been discovered at Douglas Lake, near Merrit, B.C. The mineral is isomorphus with chrysotile, and occurs in veinlets crisscrossing through serpentine, much in the same way that chrysotile occurs at Thetford and Black Lake.

The Mines Branch Analysis, Ottawa, shows 47.87% magnesia, 41.44% boric acid, 10.69% water.

BRITISH COLUMBIA INDUSTRIAL NEWS

R. W. Mayhew, managing director of the Sidney Roofing Co., has announced that, as a result of the recent fire that gutted the Sidney factory, the company's activities will be concentrated at the Victoria factory, where a new building will be erected to replace the one destroyed at Sidney. The refining plant at Sidney is to be sold, the company having made arrangements for the purchase of these products from another concern.

Sir Lionel Fletcher, formerly director of the White Star Line, spent three months on the Pacific Coast in company with J. J. Barrett, of Kilmarnoc, Scotland, and made some heavy purchases of timber lands in the neighborhood of Revelstoke in the interest of a British syndicate. While nothing authoritative has been announed, it is rumoured that Sir Lionel and his associates purpose erecting a large pulp and paper mill on the lower Arrow Lake, and that arrangements have been made with the West Kootenay Light & Power Co. for a supply of electricity from the Bonnington Falls plant, about twelve miles away. At Sir Lionel's application a liquidator was appointed to take over the assets of the Forest Mills Co., Ltd., and it is believed that this company's holdings will be incorporated in the new concern.

The Western Abrasive Paper Co., Limited, which was organized in Victoria last year for the manufacture of abrasives and abrasive papers, has leased a group of mining claims, containing an extensive deposit of garnets, near Wrangle, Alaska, from the Alaska Mining and Manufacturing Co., of Minneapolis. J. R. Frizell, one of the directors of the abrasive company, has left for Wrangle to superintend the mining and shipping operations.

Messrs. Crowell and Leland, of the Mead Engineering Co., of Drayton, Ohio, are getting out the plans for erection of the plant for the Prince Rupert Pulp & Paper Co., at Seal Cove, and Mr. Barrow, also of the Drayton Company, is looking after the designs for waterpower development.

The Northwest Iron & Steel Co., of Spokane, has decided to erect a 25-ton electric iron smelter in Stevens county, just below the international boundary. It is understood that the company proposes to use British Columbia magnetite ore blended with limonite from Stevens county.

The Calcining Process Co. has been organized in Vancouver with a capital of $9,000, for the purpose of buying, selling, dealing in natural and other cements, lime, plaster, magnesite and hydro-magnesite.

The Stonite Products Co., Limited, has been organized in Vancouver with a capital of $200,000, for the purpose of dealing in stone, marble, granite, sand, gravel, lime, brick, concrete, cement, and other building materials.

The Sweeney Cooperage Co., of Victoria, the B. C. Stave & Headings Co., and the Vancouver Cooperage Co., of Vancouver' which practically controlled the barrel trade of British Columbia, have amalgamated to form the Canadian Western Cooperage Co., Ltd., with head office in Victoria, and Leo Sweeney as general manager.

The Prince Rupert Pulp & Paper Co. has acquired the British Columbia holdings of the North Empire Timber Co., comprising a large timber area near Prince Rupert, 90 per cent. of which contains spruce and hemlock.

The Clayburn Co., Limited, has re-opened its plant at Kilgard, B.C., and will manufacture sewer-pipe.

The British Columbia Cement Co. has closed its plant at Tod Inlet, ten miles from Victoria. With the exception of the heads of departments, the plant has been run for some time entirely by Oriental labor. The value of the output in 1919 amounted to $260,000; during that year the Tod Inlet plant was amalgamated with another plant, situated on Saanich Inlet, Vancouver Island, the lattr being still in operation.

REPORTS FROM YUKON AND NORTHWEST TERRITORIES

(Special Correspondence to "Canadian Chemistry and and Metallurgy")

A. H. Lowe, chief geologist for the Mackenzie River Oil Co., recently left Edmonton for Peace River with a party of six men. Mr. Lowe and his party are the advance guard, and will proceed to the company's property, situated north of the Imperial Oil Company's holdings. The company will operate three drills during the present summer.

The Yukon Legislature unanimously adopted a resolution urging the Federal Government to extend the Yukon trunk road and telegraph system to the Fort Norman oil fields. Fort Norman is only one degree of latitude north of Dawson and 500 miles east. The resolution points out that this is the shortest possible route to Fort Norman, and that the present Federal Government road system, extending the length of the Yukon, now reaches to within 360 miles of Fort Norman, and that by the construction of this last link through connection could be made to Skagway, which is a port of call of large Canadian and other steamships connecting with Prince Rupert and Vancouver throughout the year. There is at the present time railway communication between Skagway and Whitehorse, and from the latter town to the new silver camp at Mayo is little over 500 miles, with roadhouses along the whole route. This route, the resolution emphasizes, would be 800 miles shorter than any other possible route.

Considerable activity is expected in the Yukon this year. Booking agents state that already 600 tourists are booked for Dawson, the Mayo Silver district being principal drawing card.

MAKING DYESTUFFS IN CANADA

Canadian Dyes, Limited, a new company, has been organized to manufacture dyestuffs at Trenton, Ont. This is the first time that any company has entered the manufacturing dyestuff field in Canada. They have secured a two storey brick building on the waterfront formerly equipped for the manufacture of pigments, etc. It is anticipated that operations will be at the production stage in the course of a few weeks. A few standard dyes largely used in textile industries will be placed on the market. The officers of the company are:—C. B. Wright, president; D. R. Stoneleigh, secretary, and D. H. Rice, of New York, vice-president.

OVERSEAS AND FOREIGN NEWS

(Special Correspondence to Canadian Chemistry and Metallurgy from our London Representative)

English Chemical Trade Associations Amalgamate

The British Chemical Trade Association and Chemical Dyestuff Traders' Association have decided to amalgamate. The difficulty to date has been in the formation of an executive council.

Manufacture of Important Organic Substances

A number of British dyestuff manufacturers are considering taking over patents of Mr. Gilbert Owen, for the production of H , gamma and other acids. Dr. H. D. Law reports favorably on the new processes. H acid, it is claimed, can be produced to sell at 6s. per pound. With the plant suggested, Cleve's Acid, Schaeffer's Acid, S Acid, as well as R and G Salts, could be manufactured economically.

British Zinc Industry

Zinc smelting industries in England are in poor shape, with uncertain prospects. Plants are reported as closed in South Wales. Much research work was done in England during the war on electroiytic recovery. A move is on foot to attempt the recovery of zinc from low grade ores in Scotland, where an inferior fuel is avilable, which might be used to generate cheap electric current.

H. M. Stationery Office, London, has available reports on methods used in recovering sulphuric and nitric acids, in making explosives.—12s 6d.

French Chemical Industries

Conditions are not the best with French chemical industries. A report from Lyons states that the slump in textiles has injured the chemical trade to some extent. Pharmaceutical industries and dyestuffs are making progress with factories running to capacity. This is export business. France is now producing 70% of her chemical requirements. German goods, in particular those derived from coal tar, are selling in France in competition due to destruction of French mines. Sulphuric and nitric acids, ammonia and chlorine have declined.

In the perfume business, there has been a regular boom since the war. Eastern connections, Japan, China and India, supply France with menthol, camphor oil, cinnamon. Some raw materials come from Morocco, Tunis and Madagascar. Many war plants have been turned into perfume distilleries. The Alp lavender crop, which is used at Lyons, was valued at 20,000,000 francs. Quotations for lavender varied from 40 to 100 francs per 100 kilos. Business with Japan in finished products has fallen off lately, and it would appear that the perfume distilleries have about reached the height of their expansion.

German Chemical Conditions

Chemical Prices Still Falling.—The downward movement of prices in the chemical industry still goes on unchecked, for home consumption is very slow, and the export trade is nil, except with neutral countries. The market is much quieter now that goods held by speculators are being absorbed. There is practically no demand for tar products in the home market, and export has therefore been permitted to a greater extent. Nitrates are in brisk demand, though things are as unsatisfactory as ever in the potash industry.

Germany has now abolished the 50 per cent. export duty on coal-tar dyes in general, including artificial indigo, and also on natural indigo carmine. She is making a strenuous effort to regain her former supremacy in the synthetic chemical industry, and the Government is backing up the dye-producing firms in every possible manner.

The rate of the export levy for certain German chemicals has been refixed as follows (figures in brackets denoting former rate):—Oxide of lead 1 per cent. (8); nitrate of lead, 4 per cent. (10); lead acetate, 3 per cent. (10); chloride of zinc, solid or liquid 2 per cent. (10); calcium chloride, 3 per cent. (6); sodium sulphite, 1 per cent. (5); oxide of zinc, white, 1 per cent. (10); lithopone, 3 per cent. (10).

The great German Dye Trust, encouraged by the success which has attended its efforts since the end of the war, is arming itself with a vast amount of fresh capital so that it may conduct a still more vigorous foreign campaign. The Trust consists of the following important firms, their capital being given in marks:

Hoechester Dye Factory (Messrs. Meister, Lucius & Bruning)	252,000,000
Elbertfelt Dye Factory (Messrs. Bayer)	252,000,000
Baden Aniline and Soda Factory	252,000,000
Treptow Aniline Manufacturing Co.	88,000,000
Grieshim-Elektron Chemical Factory	63,000,000
Weilerater Meer Chemical Factory	126,000,000
Total capital	Mk. 1,056,300,000

The first-mentioned two firms have already announced their intention to increase their capital by Mk. 178,000,000 each to Mk. 430,000,000. The others are to follow suit on a considerable scale, so that finally the financial backing of the combine will be Mk. 1,760,500,000, an increase on the present capital of two-thirds. According to the latest reports, trade is flourishing. "We are doing very good business," says the Weilerate Meer Co. The Elbertfelt concern reports a dividend for 1920 of 20 per cent. (18 per cent. last year) and an increase of profits from Mk. 43,313,319 to Mk. 67,500,225. The Hoechester Co.'s net profit for 1920 was Mk. 64,561,646 and the dividend 20 per cent. as against 14 per cent.

Many of the great chemical firms, too, have just reported excellent results for the year. Take the following:—

The Harkotsche Coal Co. & Chemical Factory Ltd., of Gotha. —1919, net profits Mk. 653,000, dividend 6 per cent.; 1920, net profits Mk. 2,497,000, dividend 16⅔ per cent.

The Chemical Industry Co., of Gelsenkirchen Schalke.—1919, net profits Mk. 1,665,652, dividend 25 per cent.; 1920, net profits Mk. 5,805,128, dividend 25 per cent. and 50 per cent. bonus.

The Chemical Factory Ltd. (Schering and C.), Berlin.—1919, net profits Mk. 1,800,000, dividend 18 per cent.; 1920, net profits Mk. 3,500,000, dividend 25 per cent.

The Von Heyden Chemical Factory, Dresden.—1919, net profits Mk. 2,755,274, average dividends on various kinds of shares 8 per cent.; 1920, net profits Mk. 8,432,838, dividend 16½ per cent.

Upper Silesian Coke & Chemical Factory.—1919, dividend 17 per cent.; 1920, 17 per cent. and 13 per cent. bonus.

The Glachau Chemical Works.—1919, dividend 15 per cent.; 1920, 27 per cent.

The Scharff Chemical Factory, Breslau.—1919, no dividend; 1920, 10 per cent.

Chemicals for Entente Countries.—The Chemical Industry Association, Mayence, is raising its capital from Mk.7,000,000 to Mk.12,000,000; the United Chemical Products Factory, Stettin, from Mk.15,000,000 to Mk.24,000,000; the Uuited Chemical Works, Ltd., Charlottenburg, from Mk.3,000,000 to Mk.9,000,000; and the Teichgraeber Chemical Factory, Berlin, from Mk.9,000,000 to Mk.18,000,000. The big chemical firms are many of them doing an active foreign business in an indirect way. Vast amounts of chemicals have lately been sent to such countries as Poland, and from there, as coming from nominally Polish firms, they will reach Entente countries.

To take the case of Poland, that country imported 10 times the amount of German chemicals, nearly Mk.90,000,000 in value, during the first three-quarters of last year, as compared with the first half of 1919. It is idle to suppose that these increases correspond to Poland's increased needs. It is suspicious that small and often new Polish concerns are buying up big German firms. The same is going on with dyes, and in other countries as well.

The German Metal Federation has permitted the export of 50 per cent. of the monthly ferro-alloy output as well as 50 per cent. of the stocks carried by producers on March 15. The

quota has been increased to 75 per cent. for ferro-molybdenum.

The Chemische Fabrik Griesheim-Elektron, of Frankfurt, has taken up the production of ferro-alloys, especially ferro-tungsten, ferro-chrome, and ferro-molybdenum.

Malay Tin Exports

An official cablegram from Kuala Lumpur to the Malay States Information Agency, 88 Cannon Street, London, E.C. 4, states that 2,190 tons of tin were exported from the Federated Malay States in the month of March as against 3,111 tons in February and 2,770 tons in the corresponding month of last year. The total export for the first quarter of the present year was. therefore, 8,599 tons, compared with 10,049 tons last year and 9,318 tons in 1919. Appended are the comparative statistics:—

	1919. Tons.	1920. Tons.	1921. Tons.
January	3,765	4,265	3,298
February	2,734	3,014	3,111
March	2,819	2,770	2,190
Total	9,318	10,049	8,599

Dye Industry in Japan

Local conditions make the position of this industry uncertain. In 1913 importations amounted to 6,000 tons, with no producing factories. By 1917 some 50 plants were making dyes. The industry is still alive, but is not running fast, although it is protected. When Japanese conditions are again normal, the business should continue in a small way at least.

United States Phosphate Exports

After falling off about 90% during the war. United States exports of phosphate have increased to nearly pre-war marks. In 1920, some 1,089,712 tons were exported.

Brazilian Water Powers

A recent survey shows that there are fifty-one waterfalls in Brazil, capable of developing a total of 50,000,000 horsepower. At the present time, less than 500,000 horsepower is utilized.

Chile Nitrate

The Chilean Senate has before it a bill providing for the establishment, under Government control, of an association of nitrate companies. In this way, the Government proposes to trade in nitrate directly.

Australian News

The placing of a duty on large steel and iron pipe, soda ash and soda, has been postponed to October, 1921. The Mount Elliott Co. is trying to raise £1,000,000 in England to erect works capable of treating 1,000 tons of copper ore daily. The 1920 value of osmiridium from Tasmania was £77,114. It stands fifth in Tasmanian mineral production. Osmiridium is used chiefly to harden pen points and delicate bearings. The order of production stands: copper, tin, zinc, silver, osmiridium.

MAY BE VERY VALUABLE GOLD DEPOSIT

What appears to be an important discovery of gold has been made at Elbow Lake, Northern Manitoba. The following information was secured through the kindness of Commissioner of Northern Manitoba, R. C. Wallace, and while not official came to the Commissioner from a reliable source.

From reliable information it would appear that discovery is in porphery carrying stringers of quartz in which gold may be seen over width of fifty feet. High grade is three inches deep, three hundred and fifty feet along strike from discovery, but intervening part of lode is clay covered. From this information the discovery would appear to be important.

AMERICAN MINING CONGRESS

The American Mining Congress will hold their annual meeting at Chicago, Ill., beginning October 17th next. The annual National Exposition of Mines and Mining Machinery will also open at Chicago on the same date.

NORTHERN ONTARIO MINING NOTES

About three years' supply of ore is indicated in the present workings of the Ontario-Kirkland Gold Mines, Limited. Over 3,500 feet of drift work has been completed on the 300 and 450 foot levels. A second shaft is being raised from the 300-foot level, this new shaft being a three compartment one.

It is expected that the mill will be completed in September next, the timber for the mill construction being cut on the ground in a saw mill erected for the purpose. The company executives are optimistic over the work and feel assured that this mine will be classed as a gold producing mine by the fall of this year.

Syndicate Buys Hollinger Reserve

The Trusts and Guarantee Company, Toronto, acting as executors for the Barney McEnaney Estate, have sold the property known as the Hollinger Reserve to a syndicate headed by A. E. Osler & Co., of Toronto. The new company will be known as the McEnaney Gold Mines. The Hollinger Reserve lies on a direct line west of the Hollinger Consolidated Mine, and development work has extended to a depth of 300 feet. During the early days of the Porcupine District, surface outcroppings of gold showings made this property one of the most widely known, but lack of funds prevented the late McEnaney from reaching the producing stage. It is planned to carry on development work on a large scale.

Mining Costs Decline

With the exception of freight rates, all the major items connected with the cost of mining have decreased ,in some instances as much as 20 to 30 per cent. Steel, powder, chemicals and machinery have all had substantial reductions, while labor costs too have decreased and a better class of workman is available. This spring is an unusually good time to do exploration and development work in the North, and in this connection, "The Northern Miner" (Cobalt, Ont.) states that the cost of opening up a prospect this season is 25 per cent. lower than last year.

New Railway for Kirkland District

Mining men in Northern Ontario are enthused over the announcement that work in the construction of a railway to serve the Kirkland District will be commenced this summer. It will be a medium guage railway, served with oil burning engines, and the line will be built from Swastika eastward, and it is hoped to have the line into Kirkland before the end of the year. Later on the line will be extended through Lebel to Larder. The operating company is known as the Northern Light Railway Company and is headed by some of the best known financial men of Ontario, the officers being:—President, F. L. Culver, president of Beaver Consolidated Mines and Kirkland Gold Mines; vice-president, Hugh Blair, president of Eby-Blair, Limited, Toronto; treasurer, W. H. Alderson, manager Gutta Percha & Rubber Co., Toronto, and president of Toronto Board of Trade; manager, Col. R. P. Rogers, who commanded the Canadian Corps troops of light railway construction in France. The project also includes the building of a line eventually from Swastika westward taking in Matachewan, Gowganda, and West Shining Tree.

Notes

Hollinger Consolidated have acquired the power rights for Kettle Falls on the Abitibi River and engineers have surveyed the falls for their possibilities.

During the last week in May operations at the Mining Corporation's Mine at Cobalt were resumed and a 50 per cent. increase in silver production is agreed on by operators and men. Over 200 men are at work on their property.

Announcement of the new light railway has caused considerable action in the Matachewan district. Prospectors are getting busy and a good deal of assessment work is being done.

An important find has been reported on the Moffat-Hall

property in Lebel township of the Kirkland Lake district. The find is 10 feet wide with quartz and feldspar.

Construction of the new mill for the Ontario-Kirkland Company is proceeding and it is planned to have the mill completed by the fall.

Prospectors are reported to be active in Bernhardt and Morrisette townships which are north of Teck and Lebel.

For the week ending May 27, the La Rose mine was the only shipper from Cobalt, sending out 84,065 pounds of silver ore.

The large Porcupine producers have demonstrated that they are capable of enormous steady output. Better grades of ore are being met with on the Dome properties and the Hollinger is reported to be treating 3,200 tons per day using 200 stamps and a ball mill with a capacity of 500 tons, and the management is considering a further ball mill. One shaft at the Hollinger is 1,500 feet in depth and considerable ore is coming from the 1,250 foot level.

WORK ON CHIPPEWA POWER DEVELOPMENT NEARS COMPLETION

Seven thousand men are employed rushing the great Chippewa-Niagara hydro-electric power development scheme to completion early in September next. Day and night shifts are at work and by September 1st two big 55,000 horsepower generators will be ready for operation, giving the Ontario Hydro-Electric Power Commission 110,000 h.p. with another 55,000 following within a few months. The power house at Queenston does not show a trace of the fire that occurred there during May and the two generators scheduled for operation in September are already in place. On May 29th the big cut into the rock at the base of the 300 foot cliff was ready to receive the 12-foot steel tubing for the first generator, and during June the work on the cut for the second generator has progressed favorably. When completed the power house will have nine generators, but only the first five units are to be completed until the demand for power catches up with the increased supply. At the top of the cliff the concrete work on the forebay is well up to schedule, and in fact on June 1st was nearly 70 per cent. completed. This immense concrete work consists of concrete structures that will carry the water into the penstocks for the 300 foot drop to the generators. All the concrete work of the forebay is being completed this summer, for while only five generators are to be installed for the present, the outlets not immediately needed will be shut-off at the lock gates. The rock walls of the forebay have been sprayed with 'guvite,' a cement preparation that will prevent erosion from seepage of water.

Work on the "power" canal bringing the water supply from the Chippewa River above Niagara Falls, is now well on to completion. A large part of the canal has already been lined with concrete. The only part of the whole work that may possibly delay opening by September 1st is the cutting of the canal through the rock. There were 11,000,000 cubic yards of rock to cut the canal through at one section, and of this on June 1st, 900,000 cu. yds. remained to be cut. The latest engineering equipment is being used, and any delay owing to the heavy rock cutting would not be more than a few days.

CHEAP MOTOR FUEL

Measures are being taken to produce a motor fuel on a scale big enough probably to make it a serious rival to petrol, by the Distillers Company, Ltd., England. The fuel consists of a mixture of 50 per cent. of alcohol, 25 per cent. of benzole, and 25 per cent. of paraffin. It is believed that the new fuel can be produced in large quantities at 2s. 8d. a gallon, which is considerably cheaper than the present price of petrol. The mileage, however, is not quite so high. A slightly higher compression is required, but its use exercises no harmful effect upon the engine.—CHEMICAL TRADE JOURNAL (London).

Catalogues, Industrial and Trade Literature

"DIRECTORY OF MEMBERS OF ASSOCIATION OF BRITISH CHEMICAL MANUFACTURERS"

This Association is incorporated and commands a capital of £50,000,000. This book gives the products manufactured by each firm. These include refined and C.P. Chemicals. The products are listed in French, Spanish, Italian, Portuguese, Russian and Japanese. The offices of the Association are at 106 Picadilly, London, W. 1. Copies may be secured there or a few are on hand in the office of Canadian Chemistry and Metallurgy.

"INTERNATIONAL HANDBOOK OF THE WORLD'S CHEMICAL INDUSTRY AND TRADE"

Edition E., Part I, 752 pp., by W. A. Dyes. Hoff'schen Verlagsbuchdruckerei Gebr, Jenne. G. m.b. H. Wittenberg, Germany.

This author has undertaken a considerable task and a most ambitious program and we must say with evidence of good success. In a work of this kind something must be left out but very little that was known to the author seems to have been to have been discarded. Occasionally his sources of information in trade matters may have been second hand, but the reference is there. A little closer study of original sources and in short more attention given to American reports instead of European comments on the same would be helpful for some American items.

The book is written in three languages, French, German and English, but mostly in English and German. One page of a continued narrative may use all three. Something on every subject is available to any reader. These sudden language changes are not unpleasant. The type of information given is for the most part industrial and it is certainly doubtful if any other book or directory gives anything like the same general information for all countries. A very good history of German chemical developments during and since the war is presented. A fairly complete list of manufacturing chemical people in England, France and Germany is given. The task of preparing the book has been great, and no doubt hurried, but the result is a distinct addition to directory literature on Industrial Chemistry.

"Hand Book of Commercial Information for India"—Second Edition, 1919—Price 2s. Published by Director-General of Commercial Intelligence, 1 Council House Street, Calcutta, India. A most complete record of ports, imports and exports of India.

"Directory of Principal Exporters of Indian Produce and Manufactures." Published by Commercial Intelligence. Free.

Bacteriological Apparatus (Pathological and Biochemical)—This is the title of a 594 page catalogue gotten out by the Will Corporation of Rochester, New York, the company formed in January, 1919, to take over the Chemical Department of the Bausch and Lomb Optical Co., and who are represented in Canada by the Topley Company, Ottawa, Canada. This catalogue is a complete work relating to apparatus used in bacteriology and biochemistry, and in one very outstanding feature is a "real catalogue" in that for every one of the thousands of articles listed, a price is quoted. While, of course, these prices are subject to change without notice, still they give the prospective buyer information that is often essential in making actual purchases. It would be impossible to mention all the apparatus shown in this catalogue, the work is complete in every particular.

A booklet is also obtainable from the Topley Company, describing the Elliott Ion-O-Meter, an apparatus for use in H. ion determination. An interesting bibliography on H. ion concentration is given in this booklet.

LATEST CHEIMCAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

Reported to Canadian Chemistry and Metallurgy by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Electrolyzing Cobalt Solutions.
Elisha B. Cutten, 211750, May 24, 1921. Co is deposited from a sulphate solution while the neutrality of the electrolyte is maintained by the presence of a carbonate which forms an insoluble ppt with the liberated acid radical.

Anhydrous Aluminium Chloride.
Paul Danckwardt, 211752, May 24, 1921. A molten metal chloride is electrolyzed in contact with an Al compound, the Cl formed being allowed to react with the Al to form $AlCl_3$ at a temperature sufficient to volatilize the anhydrous $AlCl_3$.

Process of Electrically Depositing Aluminium.
Glen L. Williams, 211244, May 3, 1921. An Al compound such as $Al_2(SO_4)_3$ is dissolved oleum and subjected to electrolysis. The bath may be heated to 100°.

Apparatus for Analyzing Flue Gases.
Herbert M. Sharp, 211201, May 3, 1921. The apparatus consists of an electric circuit, a receptacle containing conductive liquid into which electrodes are submerged. a conduit delivering gas into the liquid and past one of the electrodes so that the gas bubbles emerging from the conduit press the conductive liquid away from the electrode and interrupt the circuit, and means controlled by the circuit for indicating the number of interruptions. A desired number of such receptacles are connected in series, each containing an absorbent for a particular constituent of the gas.

Electrolytic Refining of Tin.
Jas. P. Norrie, 211476, May 10, 1921. In the electrolytic deposition of Sn an electrolyte consists of hydrofluosilicic acid with a small amount of H_3PO_4 to render the Pb contents of the impure Sn insoluble. Cresylic acid may be added to prevent growth of Sn crystals on the cathode. See also No. 211475.

Process for the Production of Synthetic Camphor.
Roland L. Andreau, 211897, May 24, 1921. See also No. 211846.

Manufacture of Carbon Electrodes.
P. Leone Tagliaferri, 211671, May 17, 1921. An apparatus for baking C electrodes consists of one or more conducting hars connected to a source of current and extending through the electrode enclosed in an insulating casing.

Electrode Holders.
Carl W. Soderberg, 212181, May 31, 1921.

Soldering or Amalgamating Metals.
Wm. E. Wyatt, 211885, May 24, 1921. A soldering flux contains $ZnCl_2$, 4½ lbs.; NH_4Cl, 11 oz.; Hq, 2 oz., and HCl, 2 drops in 7 imperial pints of water.

Cakes for Carbide Production.
S. A. Wisdon, 212241, May 31, 1921.

Manufacture of Esters.
T. H. Durrans, et al, 211664, May 17, 1921. Esters are made by bringing vapors of an alc and of a fatty acid into contact with a catalyst carried by a solid body inert to the reaction conditions at a temperature not exceeding 300°, the temperature and pressure being such as to maintain the alc, acid and produced esters in the state of vapor without dissociation or decomposition of the compounds. The catalyst may be H_2SO_4, H_3PO_4, $ZnCl_2$, etc., applied to a support such as pumice, coke, asbestos, etc.

System of Handling Peat.
E. V. Moore, 211575, May 17, 1921.

Treating Iron Ores in Blast Furnaces.
L. P. Basset, 211498, May 17, 1921. The C used as a fuel for heating the ore, and, if desired, as a reducing agent, is introduced into the lower part of the furnace in a very finely pulverized condition with sufficient air to insure on combination the production of only CO.

Continuous Process for the Manufacture of Esters.
Art. A. Backhaus, 211675, May 17, 1921. An organic acid is passed in counter current to gradually increasing concentration of Alc in the presence of a dehydrating agent while distg. off the esters and removing the water formed. Methyl acetate is prepared by passing AcOH in counter current to gradually increasing concentration of MeOH in the presence of strong H_2SO_4 and the acetate formed is continuously distributed off and the water removed. See also No. 211675.

Process for the Manufacture of Perborates.
Johann K. Langhard, 211913, May 24, 1921. Perhorates are produced by the electrolysis of a borate solution in the presence of a cyanogen compound.

Process for Extracting Copper, Gold and Silver from Ores.
H. Foersterling, et al, 210024, April 5, 1921. The ores are treated with a cyanide solution to extract the metals therefrom and the value charged solution is deacted upon with a moving adherent film of an alkali metal amalgam capahle of displacing the value in the solution and of regenerating the original cyanide.

Recovering Zinc from Slags, Ores, etc.
F. C. W. Timm, 210165, April 5, 1921. Zn is removed as ZnO from zinciferous materials by smelting the material in contact with reducing substances and removing the ZnO from the slag by passing a current of heated gases downwardly through the charge.

JAPAN CEMENT MANUFACTURERS GET BUSINESS IN AUSTRALIA

Japanese cement manufacturers up to May 8th last had signed contracts for the delivery of over 50,000 bbls. of cement for the harbor construction work at Melbourne, Australia. The price is said to have been extremely low so that little profit will be made on the business, but the Japan manufacturers are taking this opportunity of reducing their stocks in the present period of depression. This is one way of bringing business back to normal that more Canadian and American concerns might well follow.

OLEOMARGARINE GIVEN ANOTHER YEAR

While it was the intention of the Canadian Government to close the long drawn out margarine discussion by placing Canada in the same position as most other countries, a few amendments came up, resulting in regulations staying as they are for another year. Members from dairy counties still see fit to oppose the manufacture and sale in Canada, but they have little hope of doing so. An amendment to force manufacturers to print the percentage composition on wrappers was lost. The house carried the bill in favor of margarine by 130 to 33 with the Farmers Group voting with the Government.

PREPARING TO WORK SILVER ISLET MINE.

A gang of men is engaged repairing buildings, shaft houses, and pumping the water out of the shaft at the Silver Islet Mine, on Silver Islet, Lake Superior, near Fort William. This mine, believed to be a valuable silver deposit, had lain dormant for over forty years until last year, when some exploration work was done. The real work of exploration this year will commence June 1st and will be completed, it is expected, by November 1st.

DOMINION COAL CO. INCREASES OPERATIONS.

The opening of navigation on the St. Lawrence, and the coal strike in Britain, have been a factor in starting operations in the mines of the Dominion Coal Co., Nova Scotia, on a large scale. They are now operating eleven of their twenty-two mines, and eight thousand of a total of ten thousand employees are at work. Some of the mines have been closed down and others on short time for some months.

SYNTHETIC ALCOHOL FROM CARBIDE

In the French journal "Journal de l'Acetylene," November, 1920, there appeared an interesting article on the manufacture of alcohol from calcium carbide, with particular reference to the cost of production. The article purported to disprove the statement appearing in a French paper that the cost of the production was 5 centimes per litre. The process used in German and Swiss plants during the war was by transforming acetylene into ethyl aldehyde and adding hydrogen. In theory it takes 1.6 kg. of carbide and .45 kg. of hydrogen to produce 1 kg. of alcohol, but for practical operations these quantities should be increased about 20 per cent. The writer states that the cost therefore of the raw materials is approximately 2½ francs per litre of alcohol. A significant point is that the Swiss works which produced alcohol from carbide during the war have now ceased to manufacture it, but the writer contends that in the event of the price of calcium carbide being sufficiently reduced, alcohol from carbide will again be produced for commercial purposes.

An English steamboat with a cargo of 6,000 tons of nitrate for the Agricultural Syndicate in Poland has arrived at the port of Danzig. A further cargo of 12,000 tons is expected shortly.

PLATINUM RECOVERY FROM B.C. SANDS

It is reported that S. J. Marsh is erecting a plant for washing the black sands of the Upper Fraser River, B.C., with a view to recovering platinum. Preliminary work indicates a sufficient content of platinum and gold to make future prospects good.

PORCELAIN MONEY FOR GUATEMALA

A series of porcelain money for Guatemala has been designed at the former royal porcelain works at Meissen, Saxony. If accepted, this currency will replace the hard rubber coins now used in Guatemala, where paper money cannot be used because of climatic conditions.

STRONTIUM DEPOSITS FOUND

A large body of strontium sulphate and strontium carbonate, respectively celestite and strontinite, have been found on Tidewater, 200 miles north of Vancouver, B.C., according to a recent despatch. The deposit is said to be 50 acres in extent. Strontium hydrate is used in the refining of beet sugar in some places instead of lime, and there is a possibility that strontium sulphate may be used in paint manufacturing replacing the barium now used.

Chemical, Oil and Metal Markets

The quotations below represent manufacturers' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

CHEMICALS

The Chemical trade as a whole shows but little improvement on the last few months. Inquiries are much more frequent, however, and should there be any sudden expansion considerable inconvenience would be felt, as dealers' stocks are now very low, and possibly higher prices would result, as neither buyers nor sellers are prepared to stock more than is necessary for their immediate requirements.

The Rubber and Paint Trades appear to be the only two which are getting back to anything like normal conditions, and good business is looked for during the next few weeks, from these trades. The Textile trade shows no decided improvement, and buying is still of the hand to mouth variety.

Owing to the printers' strike, there is very little demand for Dry Colors and Chemicals for the Printing Ink trade.

Heavy Chemicals.—Business is growing slowly but steadily and the market is becoming firm by easy stages. Should there be any rapid recovery, it is thought that it would again disorganize the market. Copper Sulphate has advanced 25c. per cwt. There has been an increased demand for Soda Products, such as Caustic Soda, Soda Ash, and resale parcels have advanced 5c. per cwt.

Fine Chemicals.—There has been little change during the past few weeks in drugs, and about the usual number of reductions have been made. Citric Acid has advanced 1c. per lb., Chloral Hydrate, 5c. per lb., Iodine Potash, 6c. per lb., and Camphor, 2c. The most noticeable declines were: Coumarin, 12c., Soda Nitrate, 1½c., and Ethyl Bromide, 30c. There has been a fair demand for Aspirin, and the price remains steady.

OILS

Petroleum.—Further declines have occurred in crude petroleum and the refined products. The present quotations on Mid Continent Crude is $1.00. Pennsylvania Crude has dropped during the month from $3.25 to $2.50. These quotations on both Mid Continent and Pennsylvania are below production costs and are the result of the present supply of stocks being so much greater than the demand. Buyers have witnessed the declines occurring during the past two months and are holding off, expecting further declines, and this fact, coupled with the fact that many industries using oil have been curtailing operations due to the general period of "bad business" that prevailed this past spring, has brought about the present low quotations. When compared with the quotations of last December the present prices are startling. In December, 1920, Mid Continent Crude was quoted at $3.50 and Pennsylvania Crude at $6.10, and these prices obtained during January and up to the latter part of February when a drop occurred, bringing the Mid Continent down to $1.75 and the Pennsylvania to $3.00. These prices held during March and April, but about May 1st the quotation on Pennsylvania Crude advanced to $3.50, but fell off towards the end of that month to $3.25 and the Mid Continent to $1.50. The present indications are that the present quotations will hold during the summer months, though Pennsylvania Crude may possibly drop off to $2.25, but beyond that it would seem impossible for further reductions to occur, as the oil cannot be given away and quotations are now away below production costs. The leaders in the petroleum industry may have to take radical steps to save the situation and to prevent financial loss. According to press despatches, Mr. Teagle, president of the Standard Oil Company, of New Jersey intimates that many of their wells will be greatly curtailed in operation during this summer. This procedure would give the companies time in which to dispose of a good deal of their stock.

Motor gasoline is selling at 33 cents per gallon (wholesale) and 37 cents at service stations. One often hears comments from motor car owners to the effect that gasoline is only 22 cents per gallon in Detroit and they complain of the higher price asked in Canada, but they fail to take into account several things: first, that there is a duty on the crude oil from which Canadian refineries make their gasoline; secondly, that there is also freight and exchange on that crude oil price; thirdly, that the Canadian refined product is better quality than the American; and fourthly that the Canadian (Imperial) gallon is twenty per cent. larger than the American. So when all these facts are considered, any complaint that Canadian oil companies are charging too much for gasoline, fails completely. In fact, impartial technical men who know the costs of refining and the other facts entering into the production costs including duty, exchange and freight, know that the margin of profit is very small, and is one that many of the users of gasoline would be far from satisfied with in their own business.

METALS

The metal market remains quiet, though the prospects seem to be for more activity within the next three or four weeks. Lead has advanced $3 per ton at St. Louis, and it is anticipated that copper will show an advance before the end of the month. Zinc has dropped off 35 cents per cwt., and zinc sheets are down to 20 cents per lb. Brass ingots, red and yellow, are off 2 cents per lb. Canadian structural steel and iron works are patiently awaiting more building operations and these in turn depend upon the general business situation, so that after all the old leader, "general" business must improve or the metal market will not. As the month of July opens trade does seem a little better than a month ago, but the future is still too uncertain to make too optimistic prophesies.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals and Industrial Minerals.

Inorganic.

Alum, Ammonia, lump and ground	100 Lbs.	5.00— 5.50
Ammonium Bromide	Lb.	.. —.45½
Aluminium Sulphate, high grade, bags	100 Lbs.	.. — 4.00
Ammonia, Aqua 26	Lb.	.11— .12
Ammonium Carbonate	Lb.	.16— .20
Ammonium Chloride	Lb.	.15— .20
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .14
Barium Sulphate (Barytes)	Per Ton	30.00—35.00

Barium Chloride	Lb.	.05—.07½
Barium Nitrate	Lb.	.. — .20
Barium Peroxide	Lb.	.. — .24
Barium Sulphate, B.P.	Per Ton	100.00—110.00
Battery Acid, up to and including 1.400 sp. gr.	Cwt.	3.00— 3.50
Battery Acid, over 1.400, up to and including 1.835 sp. gr.	Cwt.	3.50— 4.00
Bleaching Powder, 35% drums	100 Lbs.	.04½— .05
Borax, crystals	Lb.	.. —.07¾
Boric Acid, powdered	Lb.	.. — .18
Bromine (technical)	Lb.	.. — .38
Calcium Carbide, car lots, f.o.b. works	Ton	.. —100.00
Calcium Carbide, ton lots, f.o.b. works	Ton	.. —105.00
Calcium Carbide, less than ton lots, f.o.b. works	Ton	.. —110.00
Caustic Soda, ground, drum	Cwt.	5.75— 6.25
Caustic Soda, solid, drum	Cwt.	5.00— 5.50
Calcium Chloride, fused	Per Ton	58.00—60.00
Camphor Monobromate	Lb.	.. — 3.00
Carbon Bisulphide, in drums	100 Lb.	.. — .10
Carbon tetrachloride, drums	Lb.	.18— .20
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	30.00—40.00
Cobalt Oxide, black	Lb.	.. — 2.50
Cobalt Oxide, grey	Lb.	.. — 2.80
Copperas (Iron Sulphate) crystals	Lb.	.02—.02¼
Copperas (Iron Sulphate) sugar	Lb.	.02—.02¼
Copper Sulphate (Blue Vitriol)	Lb.	.07½—.08½
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 1.45
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fuller's Earth, car lots, f.o.b. Toronto	Ton	35.00—40.00
Ferric Chloride, crystals	Lb.	.13—.14½
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid, 60%	Lb.	.. — .30
Hydrofluoric Acid, 30%	Lb.	.. — .14
Hydrochloric Acid, carboys, 18	100 Lbs.	2.75— 3.00
Hydrogen Peroxide	Gal.	.95— 1.00
Iodine, crude	Lb.	.. — 4.75
Iodine, resublimed	Lb.	.. — 5.20
Iron Oxide (red)	Lb.	.05— .13
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lime, grey	Ton	.. —16.50
Lime, grey, in car lots	Ton	.. —14.00
Lime (hydrated) in ton lots	Ton	.. —23.25
Litharge	Lb.	.. — .14
Lithium Carbonate	Lb.	.. — 1.70
Lithopone	Lb.	.08— .10
Magnesite, calcined	Per Ton	25.00—30.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.13— .16
Magnesium Sulphate	Lb.	.03½—.04½
Mag. Sulphate, B.P., Medicinal	Single Ton	70.00—75.00
Mag. Sulphate, Technical, car lots	Ton	55.00—60.00
Muriatic Acid, 18	100 Lb.	2.75— 3.00
Nickel Salt, single, in bbl. lots	Lb.	.. — .15
Nickel Salt, single, per cwt.	Lb.	.. —.16½
Nickel Salt, double, in bbl. lots	Lb.	.. — .15
Nickel Salt, double, per cwt.	Lb.	.. —.16½
Nitric Acid, 36 carboys	100 Lb.	.09—.09¼
Phosphoric Acid, 85%	Lb.	.43— .50
Phosphoric Acid, 50%	Lb.	.29— .31
Phosphorus, yellow	Lb.	.. — .44
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.. —.32½
Potassium, Bromide, granular	Lb.	.. —.32½
Potassium Bichromate	Lb.	.. — .35
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — ..
Potassium Chlorate	Lb.	.. — .18
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash)	Sticks	.. — .80
Potassium Hydroxide (caustic potash) small drums	Lb.	.15— .25
Potassium Hydroxide (caustic potash) large drums	Lb.	.. — .10
Potassium Iodide	Lb.	3.85— 3.95
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.65— .70
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Silver Nitrate	Lb.	.. —10.00
Soda Ash, bags	Cwt.	2.90— 3.00
Sodium Acetate, ton lots or over	Lb.	.. —.08¼
Sodium Acetate, lesser amounts	Lb.	.. — .15
Sodium Benzoate	Lb.	.70— .80
Sodium Bicarbonate, 100% pure	100 Lb.	3.50— 3.75
Sodium, Bichromate, bbls.	Lb.	.12— .14
Sodium Bisulphite, powder	Lb.	.. —.09¼
Sodium Bisulphite, 35	Lb.	.05½— .06
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.. —.27½
Sodium Hyposulphite, kegs	100 Lb.	5.00— 5.75
Sodium Nitrate, refined	100 Lbs.	6.25— 7.25
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .18
Sodium Peroxide, f.o.b. New York	Lb.	.38— .40
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	.. — 2.00
	Per Cwt. in Car Lots	.. — 1.75
Sodium Sulphite	Lb.	.. — .05
Sodium Prussiate, Yellow	Lb.	.16— .20

Sulphur, ground	100 Lb.	2.75— 3.00
Sulphur, roll	100 Lb.	4.50— 4.75
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.50— 3.00
Sulphuric Acid, 66 Be, tank cars		.. —24.00
Talc, No. 1 grade	Ton	.. —30.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	.. —18.00
Tin Chloride, crystals	Lb.	.35— .40
Tri-sodium Phosphate	Lb.	.. — .08
Ultramarine, Blue	Lb.	.15— .40
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting (English)	Ton	.. —35.00
Whiting (American)	Ton	.. —30.00
Whiting	Per Ton	35.00—40.00
Zinc Sulphate, com.	Lb.	.05¾—.06½
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.10½— .13
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.. — .55
Acetic Acid, glacial, carboys, f.o.b. Shawinigan Falls	Lb.	.. —.22½
Acetic Acid, glacial, bbls., f.o.b. Shawinigan Falls	Lb.	.. — .22
Acetic Acid, 28%, carload lots	Lb.	.. —.04½
Acetic Acid, 28%, 25 bbl. lots	Lb.	.. —.05¼
Acetic Acid, 28%, 15 bbl. lots	Lb.	.. —.05½
Acetic Acid, 28%, 10 bbl. lots	Lb.	.. —.05¾
Acetic Acid, 28%, 5 bbl. lots	Cwt.	.. — 5.85
Acetic Acid, 28%, 3 or 4 bbl. lots	Cwt.	.. — 5.90
Acetic Acid, 28%, 1 or 2 bbl. lots	Lb.	.. — .06
Acetic Acid, 80%, carload lots	Lb.	.. — .12
Acetic Acid, 80%, 25 bbl. lots	Lb.	.. — .14
Acetic Acid, 80%, 15 bbl. lots	Lb.	.. — .15
Acetic Acid, 80%, 10 bbl. lots	Lb.	.. —.15½
Acetic Acid, 80%, 5 bbl. lots	Lb.	.. — .16
Acetic Acid, 80%, 3 or 4 bbl. lots	Lb.	.. —.16½
Acetic Acid, 80%, 1 or 2 bbl. lots	Lb.	.. — .17
Acetone, pure, drums or over	Lb.	.. —.19½
Acetone, pure, lesser amounts	Lb.	.. — .25
Aspirin, in 100-lb. lots	Lb.	.90— 1.05
Alcohol, Absolute Ethyl, case of 1 doz 1-lb. bottle	1-lb. bottle	.. — 2.15
Alcohol, Absolute Ethyl, in steel drums of 10 gallons capacity	Imp. Gal.	.. —15.00
Alcohol, acetone, bbls. or over	Gal.	.. — 1.40
Alcohol, acetone, lesser amounts	Gal.	.. — 1.70
Alcohol, pure, bbl., 65% O.P.	Gal.	.. —10.50
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 1.15
Alcohol, wood, 95%, half bbl. lots	Gal.	.. — 1.25
Alcohol, wood, 95%, lesser amounts	Gal.	.. — 1.30
Alcohol, wood, 97%, bbls.	Gal.	.. — 1.78
Alcohol, wood, 97%, half bbl. lots.	Gal.	.. — 1.90
Alcohol, wood, 97%, lesser amounts	Gal.	.. — 2.05
Amyl acetate, technical	Gal.	4.75— 5.25
Amyl acetate, pure	Gal.	5.75— 6.25
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — .90
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 1.40
Camphor, refined, slabs	Lb.	.. — 1.15
Camphor, refined, tal	Lb.	.. — 1.22
Carbolic Acid, white crystals	Lb.	.57— .75
Chloroform	Lb.	.. — .30
Citric Acid, domestic, crystals	Lb.	.65— .70
Coumarin	Lb.	.. — 6.00
Cream Tartar, 98%	Lb.	.25— .30
Dextrine, potato	Lb.	.. — .10
Dextrine, corn	Lb.	.. — .10
Ether, B.P. conc.)	Lb.	.. — .63
Ether, Sulphuric	Lb.	.35— .50
Formaldehyde, bbls. or over	Lb.	.. —.21½
Formaldehyde, 200-lb. kegs	Lb.	.. —.26¾
Formaldehyde, 100-lb. kegs	Lb.	.. —.27¾
Formaldehyde, 50-lb. kegs	Lb.	.. —.28½
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Gallic Acid	Lb.	1.25— 1.75
Glycerine, C.P., single tin of 56 lbs.	Lb.	.. — .31
Glycerine, C.P., two or more tins	Lb.	.. — .29
Glycerine (pale straw) single tin 56 lbs.	Lb.	.. — .30
Glycerine (pale straw) two or more tins	Lb.	.. — .28
Hexamethylenetetramine		1.10— 1.50
Oxalic Acid	Lb.	.25— .30
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.50
Phenolphthalein	Lb.	.. — 1.80
Pyrogallic Acid	Lb.	3.00— 3.50
Quinine	Oz.	1.00— 1.10
Saccharin	Lb.	3.50— 4.00
Salicylic Acid	Lb.	.. — .35
Starch, corn, ground, car lots	Lb.	.. —.04½
Starch, potato, ground, car lots	Lb.	.. —.07¼
Stearic Acid, Double Pressed	Lb.	.15— .16
Stearic Acid, Triple Pressed	Lb.	.17— .18
Tartaric Acid, crystals or powdered	Lb.	.40— .45
Tannic Acid, commercial	Lb.	.45— .65

Rubber.

The following quotations on rubber are in American funds. New York delivery:

Crude.

Para, upriver	Lb.	.. —.17½
Caucho Ball, upriver	Lb.	.. — .12

Plantation Rubber.

1st Latex Crepe	Lb.	.. —.18½
Smoked Sheet	Lb.	.. —.16½

Scrap Rubber.

Boots and shoes	Lb.	.04— .05
Automobile tires	Lb.	.. — .01
Steam and fire hose	Lb.	.. —.01¼
Inner tubes, No. 1	Lb.	.. — .08
Inner tubes, No. 2	Lb.	.. —.05¾

Tanning and Dyeing Materials

Fustic Crystals	Lb.	.30— .35
Hematine Crystals	Lb.	.25— .28
Logwood Crystals	Lb.	.34— .36
Quercitron Liquid Extract	Lb.	.09— .10
Liquid Sumac Extract	Lb.	.07— .08
Ground Sumac	Ton	75.00—85.00
Chestnut Liquid Extract	Lb.	.3½— .04
Hemlock Liquid Extract	Lb.	.06— .07
Quebracho Liquid Extract	Lh.	.5½— .06
Quebracho Solid Extract	Lb.	.07—.07½
Liquid Blended Extract (Canadian)	Lb.	.4¾—.05¼

Metals.

Aluminium, No. 1, 98-99%	Lb.	.. — .29
Antimony	Lb.	.. —.07¾
Brass, yellow ingots	Lb.	.. — .14
Brass, red	Lb.	.. — .16
Cobalt, metal	Lb.	.. — 3.50
Copper, electrolytic, small lots	Cwt.	.. —16.75
Copper, electrolytic, car lots	Cwt	.. —16.25
Copper, casting, small lots	Cwt.	.. —15.75
Copper, casting, car lots	Cwt.	.. —15.25
Gold, Pure	Oz.	23.00—25.00
Iron, Pig	Ton	.. —43.00
Lead, pig, small lots	Cwt.	.. — 6.60
Lead, pig, car lots	Cwt.	.. — 6.10
Magnesium, ribbon	Oz.	.. — 1.50
Magnesium, ribbon,	Lb.	.. —18.00
Magnesium, powder	Lb.	3.00— 3.50
Mercury	Lb.	1.10— 1.25
Nickel, shot or ingot	Lb.	.. — .40
Platinum, pure	Oz.	85.00—90.00
Silver, bar, American silver	Oz.	.. —.99¼
Silver, bar, Canadian produced, U.S. funds	Oz.	.. —.58⅝
Steel, mild, ¼ inch, base price	Cwt.	.. — 5.75
Steel, mild, 3/16 inch, base price	Cwt.	.. — 6.25
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	8.15— 8.50
Tin	Lb.	.. — .37

Zinc, sheets	Lb.	.. — .20
Zinc (spelter) small lots	Cwt.	.. — 6.85
Zinc (spelter) car lots	Cwt.	.. — 6.35

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .33
Motor Gasoline (service stations)	Gal.	.. — .37
Lighting Gasoline	Gal.	.. — .38
Naphtha	Gal.	.. — .32
Coal Oil	Gal.	.. —.20½
Fuel Oil	Gal.	.. — .08
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 1.00
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 2.50
Crude Creosote Oil, bbls.	Gal.	.. — .40
Refined Creosote Oil, bbls.	Gal.	.. — .65
Crude Coal Tar	Bbl.	.. —10.25
Refined Coal Tar	Bbl.	.. —11.50
Coal Tar Pitch, bbls.	Cwt.	.. — 2.15
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52— .57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .10
Naphthalin Balls	Lb.	.. — .11
Alpha-Naphthylamin	Lb.	.. — .51

Flotation Oils and Naval Stores.

Rosin, Grade G, in 280 bbl. lots		.. — 9.00
Rosin, Grade W.W., in 280 bbl. lots		.. — 9.50
Turpentine, spirits, single bbls.	Imp. Gal.	.. — 1.07
Turpentine, spirits, 5 to 6-bbl. lots	Imp. Gal.	.. — 1.06
Turpentine, spirits, 5-gal. container	Imp. Gal.	.. — 1.22

Waxes, Gums, Vegetable and Essential Oils.

Essential Oils—

Cedar, leaf	Lb.	.. — 2.00
Cedar, wood	Lb.	.. — 1.15
Camphor	Gal.	.. — 6.75
Camphor, white	Lb.	.. — 1.00
Peppermint, American	Lb.	.. — 5.50
Peppermint, re-distilled, B.P.	Lb.	.. — 3.50
Peppermint, Japanese	Lb.	.. — 3.25

Vegetable Oils—

Anise Oil	Lb.	.70— 1.00
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .21
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .19
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.30— .32
Corn Oil, in bbls.	Lb.	.. — .10
Corn Oil, tank cars	Lb.	.. — .08
Cottonseed Oil, crude, f.o.b. Mississippi Valley points	Lb.	.. —.05¾
Cottonseed Oil, crude, f.o.b. Texas points	Lb.	.. —.05¼
" Oil, summer yellow, f.o.b., Chicago	Lb.	.. — .07
" Oil, winter yellow, f.o.b. N.Y.	Lb.	.. — .08
Linseed Oil, raw, single bbls.	Imp. Gal.	.. — .97
Linseed Oil, raw, 3 to 5-bbl. lots	Imp. Gal.	.. — .96
Linseed Oil, raw, 6 to 9-bbl. lots	Imp. Gal.	.. — .94
Monopole Oil	Lb.	.. — .30
Olive Oil, foots, at Toronto	Lb.	.11½— .12

Gums—

Indian, No. 1A	Lb.	.. — .40
Indian, No. 1	Lb.	.. — .38
Tragacanth, No. 1, Ribbon	Lb.	.. — 4.50
Tragacanth, No. 1, Flake	Lb.	.. — 3.50
Tragacanth, Turkey	Lb.	.. — 3.75
Arabic, clear amber sorts	Lb.	.. — .18
Arabic, regular grain No. 4 and No. 5	Lb.	.. — .22
Arabic, regular grain No. 3	Lb.	.. —.22½
Arabic, white sorts	Lb.	.. — .40
Arabic, powdered, No. 1	Lb.	.. — .25
Arabic, powdered, No. 2	Lb.	.. — .24

Waxes—

Beeswax, various grades	Lb.	.39— .51
Paraffin, 128°—130°, M.P.	Lb.	.. — .22
Paraffin, 118°—120°, M.P.	Lb.	.. — .19
Paro Wax, blocks	Lb.	.. — .20
Shellac, T.N.	Lb.	.. — .84

Fertilizer Materials.

Acid Phosphate	Ton	.. —30.00
Animal Tankage, per unit of Ammonia		.. —2.00
Animal Tankage, per unit of Bone Phosphate of lime		.. — .10
Nitrate of Soda	Ton	.. —75.00
Muriate of Potash	Ton	.. —75.00
Pure Ground Blood, per unit of Ammonia		.. — 2.25
Steamed Bone Meal	Per Ton	.. —45.00
Sulphate of Ammonia	Ton	.. —65.00

C. P. Chemicals.

Ammonia, C.P.	Lb.	.. — .27
Hydrochloric Acid, C.P.	Lb.	.. — .16
Nitric Acid, C.P.	Lb.	.. — .24
Sulphuric Acid, C.P.	Lb.	.. — .15

Industrial Gases.

Hydrogen (cylinders)	per 100 cu. ft	1.00— 1.50
Oxygen (cylinders)	per 100 cu. ft	1.40— 2.50

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EDITORIALS

A WELCOME TO OUR GUESTS.

CANADIAN Chemists will welcome in no uncertain way those visitors from England and the United States who may be present at the Annual Meeting of the Society of Chemical Industry in Canada at Montreal. They will welcome in particular that famous scientist, writer and war worker, Sir William Pope, President of the Society. In a country such as this is, where developments and progress have been made so rapid, it is quite impossible for our friends either in England or elsewhere to gauge accurately the conditions here without some opportunity for personal evidence.

In a short period of twenty years, the membership of the Society in Canada has grown from about six individuals to five sections. During that period our universities have trained a great many chemists who have played their part in developments here and in the United States. A very few have found permanent work overseas. During the period our leading industries have in some measure fallen into the hands of the chemist and suspicion, ignorance and prejudice regarding the usefulness of his work has been overcome. We have still far to go and there are yet many manufacturers who do not understand the scientific economic basis of their business well enough to benefit from chemical control, but at the same time chemists are gaining ground all down the line in Canada in a way that is most encouraging and in proportion equal to what their brother workers are doing elsewhere.

For a long time Canada exported more chemical material than she imported. The United States was able to offer better inducements to our graduates, but we believe that condition is passing away and is not likely to return. Laboratories in such cities as Montreal and Toronto have multiplied several times in the last ten years. Company after company have employed their first chemist, generally following some bitter experience where losses have been incurred through ignorance and lack of chemical control. Research has prospered in our leading universities and good work has been done in some of our largest industries and laboratories. The Dominion Goverment recognizes a demand for scientific research, but as yet have hardly made a beginning in a practical way. Their spasmodic efforts to date, while encouraging, are, generally speaking, disappointing. They are trying to buy research by the yard and have taken the attitude that the whole matter is a fad and if left alone will be dropped. In this they are of course mistaken, and in time, when a sufficient number of members in the Government become seized with an understanding of the significance of applied science and research, there is no doubt but that results will be obtained in a large way.

It will then be a pleasure to mark progress in Canada by meeting with fellow chemists from abroad. Canada is literally burdened with undeveloped resources. Her industrial equipment is straining at the almost impossible task of doing everything at once which needs to be done. She requires capital and offers a field for personal activities quite equal to any open at present. Her people are pioneers or the next generation to them in the case of most of the English-speaking Canadians, and a few more generations removed, in the case of those Canadians whose native tongue is French. But a pioneering spirit pervades all classes. Gigantic individual nerve and total disregard for hardships have been the common characteristics of her pioneering agriculturists and manufacturers. Practically every new thing that has been started here has been doomed to failure by all except the originators, but success has come and will come to those who bank and build for the day after tomorrow in this country.

Much rests with chemists themselves. They can make their position strong in an industrial way by international co-operation. They are gaining the ears of governments in a new way since the war. By gathering in convention they come to feel the power of mass action, and if their ideals are correct, and we believe no body of scientific men has more fundamentally sound economic conceptions, they can fill that larger place in the life of the nation which needs filling most acutely.

Canadian chemists will embrace this opportunity to demonstrate their progress, and the progress of their industries to their friends from abroad, and will trust in return that their visitors may receive a new conception of the present condition and possible future of Canadian progress.

Thus the Society of Chemical Industry is playing the part of the leader in holding its annual meeting in Canada this year. Canadian chemists are very greatly indebted to the activities of the Society. Its empire and international relationships are among

its most important assets, and what it has accomplished to date may be considered as a guarantee of its future great service. May the triple bond of a common language, science and ideals, establish a permanent convention of Anglo-Saxon chemists, consolidating their unity and work for larger, better things for their own peoples and the extension of world progress.

THE DIRECT METHOD IN IRON ORE REDUCTION.

THE transmutation of metals as a controlled reaction is still for the future. Canada should use her resources and if her ore and natural products present peculiar difficulties or conditions, the sooner we recognize their nature and begin to solve them, the better off we will be. A machine or process may be practical in China, Europe, or even the United States, and still not be exactly economical in Canada. Our efforts are slightly lacking at times in questions peculiar to ourselves. Instead of solving our own problems we make vain efforts to adopt something else or go on importing. Our iron ores are not comparable in general with those of the chief producing countries. Our facilities in fuel and power for working them are also different. For these various reasons we should consider and are considering, radical methods in steel production. Blast furnace practice is a standardized economical method for making cast iron, but the direct production of steel offers further fields to conquer.

It has gradually come to be recognized that for general purposes the electric smelting of iron ores as carried on in Sweden, offers certain economic problems and difficulties in expansion which cannot be met in Canada with desired satisfaction. This is but part of a general awakening to the fact that hydraulic power should be used where it is economical to introduce it and not elsewhere. The energy from our water power may easily be dissipated unless due care is taken that no class of user be made to pay in excess in order that a different type of consumer receive something for less.

Investigations including those carried on by metallurgists working for the Dominion Government have done much to give us a fairly definite idea of the lines along which some future large scale operations may go. The matter rests at present upon attempts to reduce the ore with reducing gases from the combustion of powdered coal and reserve the electric smelting portion of the operation for the iron sponge formed. The fundamental work of Dr. Stansfield of McGill, working for the Research Council on these reduction reactions has a direct bearing on this, and the recent methods of A. E. Bourcoud, as investigated by American Government authorities point to a path which seems most promising.

The reduction of a solid iron ore with a solid fuel is not reasonable. A fundamental principle of any reaction is that the elements must be in real contact. Mixed gases offer ideal conditions. A possible solution to fuel problems is evident at once if a reducing gas or flame is used, as the original source of the carbon is not so essential. Canada could use even a low grade lignite and the range might extend to oil.

From a chemical engineering standpoint the problem is relatively simple. The production of steel direct from ore involves the making of a pure reducing gas or flame from powdered fuel followed by the proper reduction of the ore in a special furnace designed in such a way that there will be maximum physical contact of the hot gas and the charge which has been preheated to a correct temperature for reduction. With this accomplished the resulting iron sponge may be melted in electric furnaces designated to operate continuously on charges received from the reducing furnace.

In a general way it would appear that something along these lines, if established, would be most suitable for conditions in Ontario or British Columbia, and for this reason the fullest investigation of the whole field of special research opened up is most desirable. If we await the development of such processes in countries where they are less required, we will probably be delayed some time and lose the economic advantages of pioneer work. To make such a process economical in every phase and continuous throughout, the study of reaction conditions must be undertaken from every angle. A very large amount of scientific data is available now. But even this is not enough. Large scale production must be considered and until private or public capital comes forward in quantity sufficient to carry through the necessary development work, this stage cannot be reached. If a reasonable opportunity is offered, we believe Canadian steel manufacturers and other capitalists will be willing to undertake developments along new lines, moving step by step as investigations are carried out. If there is to be a true Canadian steel industry it is not likely to be a duplicate of Pittsburg, but a creation, rather revolutionary compared with present ideas, but economical when thought out from the viewpoint of our own ores, fuels and hydro power.

THE NEW PRESIDENT.

DR. R. F. RUTTAN, the unanimous choice of Canadian chemists for the presidency of the Society of Chemical Industry, is a man of outstanding attainments in the profession. As some short account of his work is given elsewhere, we will do nothing more than state that in our opinion no other individual Canadian chemist combines the qualifications to the same degree which have carried Dr. Ruttan to the top. As a professor of chemistry he has been a noted teacher and academic worker. As an industrialist he combines a good sense of business and politics with his chemical engineering, and as a special pleader for Government action in industrial research, he has been a leader from the beginning and a sticker through the whole development to date.

Dr. Ruttan has undertaken a most important task involving a duty to the Society of Chemical Industry which will tax his energetic mind and body to the utmost to fulfill in addition to his many other activities.

The work of the Society is doubly important under present industrial conditions in England and America. It is more than ever essential that a strong organization of industrial chemists and manufacturers stand behind progressive government policies relating to basic industries. The organization which Dr. Ruttan will represent should be one of the chief educational factors at work in the general problem of incorporating scientific methods of production and control in our various industries. Dr. Ruttan succeeds a long line of most distinguished Presidents and it is gratifying to know that a Canadian has been selected at such a time to carry on the work of the Society. We know that Canadian members will stand behind him to make this coming year the best yet in the history of the Society, and we also feel that on better acquaintance our fellow chemists in England will find that the essential qualities of vision, strength and natural leadership are found to a marked degree in their first Canadian President.

ONE INDUSTRY THAT DIDN'T WAIT.

ELSEWHERE we notice the appearance of two volumes on the manufacture of pulp and paper. This is one of the big industries of Canada and the United States, and there was felt a need for better trained men and for text-books to help in their training.

Thirteen men comprising the educational committees of the industry in both countries met in September, 1918, in Buffalo, and at once began the work of preparing text-books covering every phase of the industry. At that meeting a joint executive was formed; a secretary and an editor appointed, and it was decided to ask the industry for thirty thousand dollars for beginning operations. This money was raised without any serious difficulty. The Canadian Pulp and Paper Association voted its share of ten thousand dollars in about three minutes, and has added five thousand dollars this year.

We point to the successful launching of the project as an example of the kind of action needed in industry to-day. No advantage in waiting for government or other official action; far better to go ahead. We called attention recently to the fact that the Canadian Pulp and Paper Association not only endorsed the Research Council's proposed bill, but at once embarked on a scheme of research of its own. One of our most practical premiers, on being approached in behalf of an industry for educational help, said, "Let the industry act first; the Government will back them." Would it not help the research scheme greatly if the C.M.A. were to put up a million dollars, go ahead on its own and be free from senates and politics?

THE INSTITUTE OF CHEMISTRY.

THE Institute is again holding its Annual Meeting at the same time and place as the Society of Chemical Industry. This is a decided convenience to those who are members of both organizations. During the year the Institute has concerned itself in the general professional interests of Canadian chemists, and there are not a few who have benefited by its employment department.

There are bound to be a number of chemists who have not learned the art of give-and-take, but who have been brought up on the "take" principle only. Every organization works more or less by the indirect method and there is at least one very prominent society whose whole motto is "service." Human nature being what it is, and the average vision of individuals being somewhat limited, it is a remarkable thing indeed that the Canadian Institute should have made the progress it has. It now numbers among its members many of the leading industrial chemists and teachers of chemistry in Canada, and in due time membership in the Institute should come to be the mark of the highest professional integrity and standing that a chemist may attain in this country.

The rest of the world, including other professions and the Government, demands a concrete and specific thing to look at when considering chemists, and it is against the laws of society to hope that as individuals as much professional progress may be made

as can be had through legitimate organization. Members of the Institute should plan to attend the annual meeting this year prepared to assist in discussions in a constructive way, and those who are not members should reconsider their position and duty to the profession in which they hope to make progress.

CHEMISTRY AT THE CANADIAN NATIONAL EXHIBITION.

A SECTION of exhibits in the Process Building marked the advent of Chemistry to the Exhibition last year. Space being at a premium, nothing by way of expansion has been found possible, but some ten companies will again make exhibits in the Chemical and Metallurgical Section.

Few movements are better designed to bring chemistry to the public. Everyone sees the Exhibition sometime, and it makes chemistry very real to people to find it in evidence right up beside the everyday products that are shown. Some day this chemical section should develop into a very large and useful annual business gathering. The directors of the Exhibition have plans for much larger things. The Exhibition may yet become more of a business proposition than it is now, following developments abroad.

It is just possible too that more attention will soon be given to industrial engineering in general. The present Machinery Hall is not sufficient, and the scope of exhibits there is rather narrow. We can conceive the time when there will be a really large industrial engineering building in which there will be a chemical section with facilities of all kinds for the duplication of processes and the carrying on of small scale operations. Chemists in large numbers should visit this section in the Process Building, as it will be well worth while.

ON TO NEW YORK.

THE greatest army of chemists that ever moved on one location for one of the most important events in the history of the science, will press into New York during the two weeks centering around September 12th.

The American Chemical Society are planning for one of their very largest gatherings. This Society numbers 15,000 members, of which 2,500 are in the New York section alone. Canadian chemists will be present in larger numbers than ever before, both as members of the American and British Societies. Men who only know Chemistry as a business will be present for the Seventh National Chemical Exposition, an event which by itself is sufficient to draw chemists in thousands.

The leading chemists of England, the United States and Canada will watch the results of this international mingling of Anglo-Saxon chemists with the greatest interest. It is a splendid opportunity for international co-operation at a time when the British Empire and the United States are really beginning to get together on important national affairs. If Canadian chemists can be at one and the same time sufficiently good Americans to translate English conceptions and good enough Englishmen to introduce the American point of view, their value as a cementing medium cannot be overestimated. It is, indeed, typical of the way currents are flowing that the English visitors should come to Canada first and then to the United States. Neither the United States or England knows any too much about Canada, and a splendid opportunity is before us to be of service and have our country become better known in an international chemical way. Let the threefold cord grow stronger until the efforts of a "noisy minority" in each country completely cease.

SIR WILLIAM J. POPE, D.Sc., F.R.S., K.B.E.

Sir William is the President of the Society of Chemical Industry. He is head of the Department of Chemistry, Cambridge University, and was formerly Professor of Chemistry at Manchester University. Sir William has made important researches along the lines of optical activity. Through his scientific work the British Government was enabled to increase enormously its production of mustard-gas in the late war in recognition of which he was created a Knight of the British Empire.

Production of Sulphuric Acid and Acid Phosphate at Trenton, Ont.

A Summary of Work Under Way on New Plant of Chemical Products, Limited, Trenton, Ontario. The Largest Single Chemical Development in Canada Since the War.

ANY chemist or chemical engineer, who remembers the condition of the large plant of the Imperial Munitions Board at Trenton after the disastrous fire which destroyed and burned a large portion of the plant, will be amazed at the present manifest evidence of activity and construction taking place on the same scorched and blasted area.

The clearing up of the wreckage and the turning of this equipment into a peace time business proposition has been the task of Chemical Products Limited. In addition to the millions originally spent by the Government, it has been necessary to make very large outlays of capital in the development of new manufacturing operations.

Some considerable credit is due those who have financed this re-organization, and in particular A. H. C. Heitman, on whom the practical burdens of plant construction have fallen. His task was not that of the original builders, namely production at any cost, but rather a combination of problems resulting from earlier construction which it may now be stated have been met in a most satisfactory and indeed economical manner.

Chemical Products Limited is really a re-organization and enlargement of a company formerly operated in Toronto, known as Chemical Products of Canada, Ltd., organized in 1916 for the manufacture of various products at that time unobtainable in the Dominion. The limited facilities for operating in Toronto, necessitated a change to some better location, and after considerable investigation the company was enlarged and re-organized with a view to purchasing the plant and property of the British Chemical Company at Trenton.

General Situation of Plant.

Equipment for the production of aspirin, phenacetins, salammoniac, etc., was shipped from the Toronto plant to Trenton, where it is now awaiting operation. The problem at the Trenton plant was to provide an outlet for the large possible production of sulphuric acid. To this end every effort of the Company has been directed.

Trenton occupies an advantageous position, midway between Montreal and Toronto on the Bay of Quinte. It is the terminal of the Trent Valley Canal, and is served by three trunk railway lines so that these facilities could not be better. The property consists of 257 acres of land bounded by the Trent River on the west, the Grand Trunk Railway on the north and the Canadian Pacific Railway on the south, and is situated outside the residential district of the municipality of Trenton. The company proposes to assist in the location of suitable industries on their property, as they have ample siding, power, water and office facilities already available. If their plans in this regard develop, Trenton should become a very important Canadian chemical centre.

The close proximity of hydro power to the plant assures a constant supply of electrical energy. Special power lines lead directly from the Hydro plant a short distance up the river to the property. The current is received at 6,600 volts and is distributed from a main receiving station through transformers which bring it down to 440 volts for use in the various plants. There is thus practically no transmission of low voltages over long distances.

In the matter of fire protection few properties have such advantages and equipment. The pumping equipment consists of a set of four triplex pumps for ordinary requirements with auxiliary electrically driven centrifugal pumps, capable of handling 6,000 gallons of water per minute. As a further reserve in case the power is lacking, there are two large Worthington steam pumps for use in emergency. The buildings are fire proof, with a large intake extending into the Trent River supplying the foot valves with pure water. The fire fighting equipment consists of 34,000 feet of underground water lines, namely 10-8 and 6" mains, supplying forty hydrants distributed about the plant. These are equipped with 100 to 150 regulation size hydrant hose. In addition there are three reels carrying 650 ft. of hydrant hose. By such precautions the insurance rate has been lowered to a minimum.

Well supplied and equipped shops of all kinds are available for repair and construction work. These shops are designed to cover any demand placed upon them in wood, metal or electrical work.

The plant consists of fifty-eight buildings comprising about half a million feet of floor space and there is 20,000 ft. of roadway throughout the area.

The Acid Works.

The principal plant is the large sulphuric acid chamber plant, consisting of two units capable of producing 120 tons of 60° acid per day. Three units are equipped with pyrite lump burners and Glen Falls brimstone Burners.

The acid plant is of steel and brick construction, absolutely fire proof. The pyrite burners consist of 72 kilns, 6' 6" x 4' 4", grate for burning lump pyrites. The Glen Falls burners are the rotary type, 48" in diameter by 20 ft. long, and will burn over 30,000 lbs. of sulphur per day. At the end of the combustion chambers for either type of burner, are located the nitre pots, at which point sodium nitrate is added, and decomposed by the aid of sulphuric acid to produce the nitrous oxides which are necessary in the production of sulphuric acid. From these chambers, the gases pass through brick dust chambers and continue into the bottom of a Glover or denitrating tower, which is 15 ft. square and 35 ft. high, having a volume of 7,875 cu. ft. The outside casing of this tower is lead, of varying thickness, while the pan is composed of 40 lead. The whole is lined with acid-proof brick, and the filling of the same is supported on arches. In this tower, the Gay-Lussac acid is denitrated, and the weaker acid is concentrated to 60° density. Approximately 12 tons of acid are circulated hourly over this tower.

Sufficient heat is afforded from the SO_2 gases, to concentrate the entire production in the chamber plant. From the Glover tower the gases, including the steam from the concentrating pass through lead lined fans, circulating through the chamber system. The first chamber is 30 ft. wide by 24 ft. high, and 199 ft. long, with a volume of approximately 150,000 cu. ft. In this chamber the largest amount of acid is produced, and settles into the large pan below, from which it is withdrawn for further use. In this chamber the thoroughly mixed gases, which have not reacted and condensed, are passed through a tower 13 ft. square by 24 ft. high, filled with quartz, in which the gases are caused to impinge, so that reaction and condensation to sulphuric acid is facilitated. Approximately 20% of the acid is made in this tower. This feature is known as the Pratt type converter tower, and is a very important unit in connection with this chamber plant, reducing thereby the necessary chamber space which would be required, without the same.

From this converter tower, the gases are again conducted to a point where they mix again with the flue gases coming from the Glover tower, and are caused to again pass through No. 1 chamber, being finally conducted to chamber No. 2, and so on to the third and fourth chambers. All acid pans in these chambers are so connected that it is possible to syphon the acid to the first chamber, or to the stock tanks below, for use in other parts of the plant.

The last three chambers may rather be considered adjuncts to the first chamber and are for the purpose of keeping gases within the system as long as possible, so as to prevent any possibility of sulphur gases reaching the exit stack by way of the Gay Lussac tower. These chambers, namely 2, 3 and 4 are 30 ft. wide by 24 ft. high, and 27 ft. long, having a capacity of approximately 20,000 cu. ft., and giving each chamber unit a total chamber capacity of approximately 205,000 cu. ft.

The Gay Lussac tower, which absorbs the nitrous oxides and controls largely the nitric consumption, is 15 ft. square by 42 ft. high, with a capacity of approximately 9,500 cu. ft., and is lined with lead and packed with chemical brick. This tower is solely used for the purpose of recovering the oxides of nitrogen, and is usually kept cold. The gas from the last chamber is conducted to this tower by 2 24" lead flues, and ascends against the descending concentrated acid.

The efficiency of this plant can be noted by the fact that the nitre consumption is very low, being around 2%, while the chamber space required per pound of sulphur, is not more than 6½ to 7 cu. ft. The acid is handled by compressed air from the stock tanks, either to storage or over the towers by means of cast iron acid eggs, having a capacity of about 4 tons. Each unit is equipped with three Canadian Ingersoll Rand Air Compressors, equipped with automatic air unloaders and control switches.

In order to appreciate the size of the buildings, it might be mentioned that the burner rooms are 80 ft. by 220 ft., the tower room of brick, being 40 ft. x 80 ft. x 120 ft. high, and the chamber rooms are 50 ft. by 360 ft. all of excellent steel construction with monitor running full length over the plant. They are asbestos protected and metal covered.

The Concentrator Plant, in which the 60° acid from the above mentioned units is concentrated to 66° acid, is contained in a small steel building, covered, like the acid units mentioned above, with asbestos protected corrugated metal, and is 60 ft. wide by 230 ft. long, 60 ft. in height, and especially designed to suit the equipment necessary. The equipment in this building consists of

View of Large Acid Works of Chemical Products, Limited, Trenton, Ontario.

eight concentrating units of a modified Scoglung type.

Briefly, the process for concentrating consists of receiving 60° acid in the storage tanks, built in the monitor of the building and from there it proceeds down from the distributors into the concentrating towers, passing on over the evaporating pans and into storage tanks below. As the weak acid descends, it is met by the highly heated gases produced from fuel oil, thus evaporating the water from the acid into specially built quartz filled scrubber towers, where the resulting weak acid is recovered.

The gases from this operation are sprayed in auxiliary towers, to prevent egress of any injurious fumes into the air. The circulation of gases is conducted by specially built lead lined fans.

Each unit was originally designed to concentrate approximately 20 tons of 66° acid per day, but the construction of the same has been changed so as to double the output of each unit, and also reduce the operating costs to a minimum from the standpoint of fuel oil consumption.

The storage capacity for sulphuric acid amounts to approximately 6,000 tons. These tanks are of million pound capacity, 24' dia. x 20 ft. high, and are built of half inch steel.

Fertilizer Plant.

This plant is a new installation and under construction at the present time. It is hoped that the same will be ready for operation within a few weeks. It is being erected by the Austin Co. of Cleveland. The plant consists of three units, namely:

1. A car unloading shed and rock storage building, which building is 120 ft. long x 78 ft. wide and contains the car unloading and rock elevating, also the conveyor equipment and reclaiming devices for handling the crude rock, building being built of British Columbia fir, covered with corrugated metal.

2. Brick building, 60 ft. wide by 80 ft. long; 85 ft. high, which will contain the rock milling machinery, air separating devices, elevators, conveyors, acid tanks, etc., necessary for handling the ground rock which is to be treated with sulphuric acid. The milling equipment in this building comprises two large Maxecon mills, manufactured by the Kent Mill Co., of Brooklyn, N.Y., and are rated to grind five tons each of half inch material, to 96% through a 100-mesh screen.

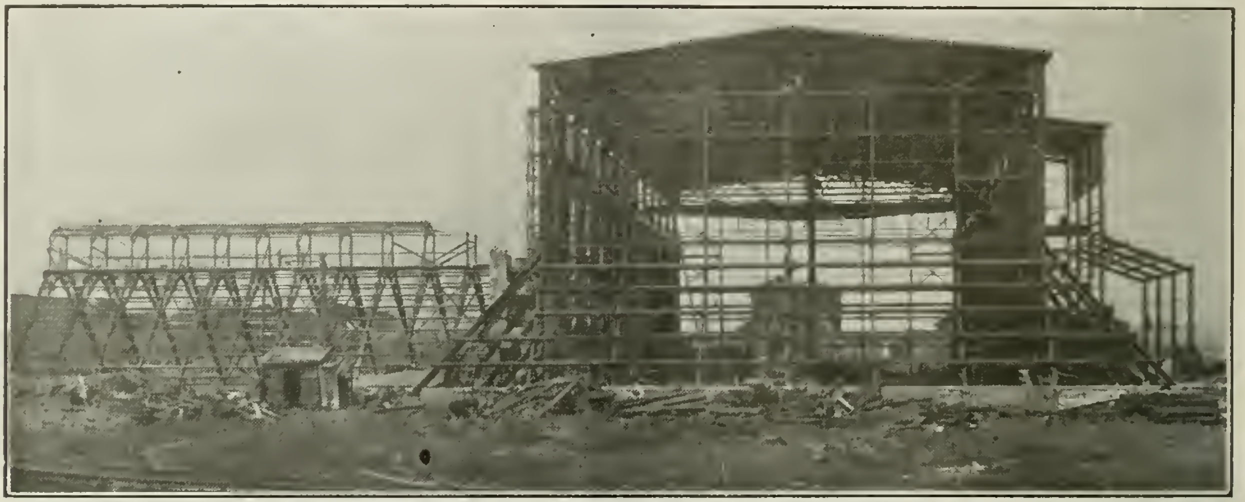
Instead of screening the ground rock, there are provided air separating devices whereby the ground dust is separated by specially constructed machines, separating the coarser particles from the dust, by readily controlled air currents, thereby saving the inconvenience and trouble usually associated with screening large quantities of material.

3. The third building of this installation is a large steel structure, 120 ft. wide by 480 ft. long, with corrugated metal sides and roof of mill type construction. In this building is located the equipment necessary for mixing the ground rock with sulphuric acid, the handling of acidulated phosphate rock and the shipping of the same.

The ground rock, as it leaves the mill room, is conveyed to a large car which is located on the top of the concrete dens. This mixer car carries the weighing equipment for weighing acid and the ground dust, and also the large two ton mixer which will mix a ton of rock and a ton of acid every two minutes. The mixer is known as the Stedman type; the most modern mixing device known. The acid phosphate produced is dropped into the 200 ton dens below and allowed to react during a period of 24 hours, after which the mixer car, having been removed from the den now filled, is moved to the next vacant unit, to continue its work, while an eight ton Alliance crane with the aid of a 3-ton Dreadnaught clam shell bucket will excavate the reaction mixture and place it upon the storage floor of the large steel building, where it is allowed to cure over a period of several weeks, preparatory to shipment to the fertilizer users.

The above mentioned crane has an 80 ft. span and will be used during the shipping season, for picking up acid phosphate and placing it into a large hopper, which feeds the milling equipment for the shipping units, passing through special clod breaking mills and from there into an 8' x 10" screen from which point it is conducted to car-loader directly into cars for shipment.

The cars are also covered by an 80 ft. car shed, built of steel.



New Acid Phosphate Fertilizer Plant of Chemical Products, Limited, Trenton, Ontario, now practically Completed.

The fertilizer plant is equipped with ample trackage, viz; two sidings, one for receiving raw materials, and the other for loading, each accomodating 20 cars.

Minor Plants.

With reference to the other buildings for minor plants, such as the manufacture of aspirin and other products, it may be said that some of these are about ready for operation. In addition to the above, it is proposed to build, in the immediate future, sodium nitrate plant, for the manufacture of refined nitrate of soda, (used particularly in meat packing plants) and also a sintering plant for sintering the pyrite ore. This ore is particularly adapted for use in the smelter, being free from the usual objectionable impurities, such as copper, zinc, manganese, arsenic, etc., occurring in pyrites. The iron content averages 68 per cent.

The sodium nitrate refining plant will yield mother liquors which can be used in connection with the potting of nitre in the sulphuric acid plant, while the pyrites ore, which at present is simply allowed to remain in the dump, will be sold at a price equal to, and including a premium over Lake Superior ore, delivered at the smelter. The material from the sintering plant can be handled by barge to steel works.

The Trent Valley Canal will also be used in connection with shipments of phosphate rock to the plant, particularly in connection with the shipment of domestic rock, which is mined in the Rideau Canal region.

With regard to pyrite supply there are sufficient deposits available in Canada for the manufacture of sulphuric acid and the industry may well be self contained in this matter. This was demonstrated during the war.

The outlet for sulphuric acid in the fertilizer field will be a growing one, and as this acid is the one most largely used by all industries, the industry may be considered as basic. Central Ontario is a field for further industrial mineral developments, and the company is well situated to take advantage of future growth. It is very desirable indeed that Canadian capital become interested in the further growth of such basic chemical industries. Upon the success of this plant depends the response of the average investor in similar chemical projects in Canada and those who are behind the idea are doing everything possible to make a good economical showing from the start.

Phosphate rock is a necessary raw material to the fertilizer trade, and it is probable that to some extent at least, mining operations will result in production in Ontario and Quebec when a Canadian market is available. Before Florida deposits were discovered, Canada exported to Europe 30,000 tons per annum. Conditions in Florida to-day are not what they were originally as far as economic production is concerned, and world sources of supply are available to Canada. In any event whether native production is profitable or not in a large way, as long as there is a development in the use of fertilizer, it will be economical to manufacture in Canada, particularly at points where water transport may be utilized. The new plant will have a capacity of 60,000 tons of acid phosphate per annum. Even now much thought has been given to extension, and this capacity may be increased and duplicated with minimum expense.

The whole undertaking has been one requiring courage on the part of investors and faith in the developments of our agricultural and manufacturing industries, along with considerable good economical management. The new capital expenditures have been large, amounting to at least half a million dollars, but anyone studying the work accomplished, will feel that everything possible has been done to utilize equipment and material already on the ground.

The re-organization of this plant and the construction of new works is a study in chemical engineering well worthy of the attention of Canadian chemists and we believe is the largest and in all probability the most successful single chemical undertaking instituted in Canada since the War.

DR. J. P. LONGSTAFF
General Secretary of the Society of Chemical Industry.

THE USE OF ANTI-GAS APPARATUS IN CHEMICAL PLANTS.

The use of chemicals in warfare has produced many protective devices and antidotes, whose efficacy in the field has gained them a favorable reception in industry. Respirators are almost entirely a war product, but the experience of soldiers has been followed by their adoption wherever poisonous gases are evolved in an industrial process. At a meeting of the Society of Chemical Industry, Dr. Levy described the latest developments in this direction. The main difference between the military and the industrial type of respirator is in the fillings of the canisters used to purify the inspired air. Ammonia respirators, for instance, are employed in cold-storage plants, with crystalline copper sulphate as an absorbent. For protection against hydrocarbon fumes in oilfields, and for cleaning out oil tanks, etc., a filling of highly activated vegetable charcoal is used. Where acid gases are found, such as chlorine sulphuretted hydrogen, or nitrous fumes, a uniform mixture of alkaline granules and charcoal is the most efficient.

New Alternating Current Electric Furnace Installation in the Department of Electrochemistry, University of Toronto

By A. E. R. WESTMAN.

THE Electric Furnace Laboratories of the Department of Electrochemistry at the University of Toronto have been moved recently to roomier quarters in the east end of the Mining Building, and a 200 kv.a. alternating current installation has been added to their equipment, which puts them in possession of a source of power such as is enjoyed by few universities in North America.

The alternating current equipment was designed and installed by Mr. J. Kelleher, who is a graduate of this university.

The high tension voltage is supplied by the Hydro-Electric Power Commission of Ontario at 2,200 volts, 25 cycles, from one phase of their three-phase system. This voltage is stepped down to a voltage suitable for furnace operation by a 200 kv.a., 25-cycle, single-phase transformer.

The transformer is housed in a special transformer room, the sides of which are built of brick and the roof of concrete. In the same room are various switches, metering transformers, and voltage regulating devices.

The high tension leads enter the building by an underground, two-wire, lead sheathed cable and terminate in a cable terminal in the east end of the transformer room. Leads run from the cable terminal to two high-tension 100-ampere fuses, one on either side of the line, which have a voltage limit of 7,500 volts, and are of the "Sand C" type, carbon tetrachloride being automatically projected into the fuse chamber when the fuse melts, thus preventing dangerous arcing.

Below the fuses are the disconnecting switches, which are switches intended not for breaking the circuit, but for disconnecting the installation from the high-tension line when the circuit is open.

The circuit breaking is done by a modern two-pole oil switch of the General Electric type, which has a voltage limit of 7,500 volts, a current carrying capacity of 400 amperes and a current breaking capacity of 1,500 amperes. It has a separate oil tank on the outside of the transformer room. The control lever contains a tripping device and a trip coil which is connected in a 110-volt D.C. circuit with an overload relay in the control station.

The instrument transformers supplying the power meters and the overload relay on the control station are connected in the high-tension circuit between the disconnects and the oil switch.

The 200 kv.a. transformer was made by the Packard Electric Company and is oil cooled. It is specially constructed to withstand the load fluctuations which are unavoidable in furnace work. The high-tension side is brought out in twelve taps, the low-tension in four taps.

Voltage Regulation.

Voltage regulation, over wide ranges and in small steps, is necessary for furnace work, and is accomplished in this installation by a high-tension plug tap switch board, a bus-tie switch and, in special cases, by a water rheostat.

The twelve taps on the high-tension side of the 200 kv.a. transformer are connected to the plug top switch board, which is situated directly in front of the transformer. The plug board itself is made of one-inch "Vulcasbestion," and is six feet long and four feet wide. The plug is made of impregnated maple, and carries four copper plugs connected in pairs by two copper straps.

The four copper plugs are situated at the corners of a rectangle and not a square, so it is impossible to plug it into the board sideways. There are eleven places where it can be plugged into the board applying the full line voltage of 2,200 volts to from one to eleven legs of the high-tension side of the transformer.

The bus-tie switch is a double throw, double pole switch situated on the outside of the transformer room wall. It is made of 6-inch by ¼-inch copper bus bars. Each pole consists of three of these, and each blade consists of two 22-inch lengths of the same size bus bar. The four terminals on the low-tension side of the transformer are connected to the bus-tie switch by four conductors, each conductor consisting of three 4-inch by ¼-inch copper bus bars. In one position, the bus-tie switch connects the two coils of the secondary in series in the furnace circuit, and by means of the plug top switch board, the voltage in the furnace circuit can be varied from 60 to 120 volts by six-volt steps. In the other position the bus-tie switch parallels the two coils of the secondary, and by means of the plug tap switch board a range of voltage from 30 to 60 volts in 3-volt steps can be secured.

The water rheostat is situated in the transformer room, and is connected in series in the 2,200-volt circuit between the main oil switch and the plug tap switch board. It is used when running resistance furnaces in order to build up the load on the transformer gradually. It consists of a 30-gallon crockery bleaching jar containing a stationary electrode 14 inches by 6 inches, made of ¼-inch sheet copper, and a similar electrode which can be moved by a windlass outside the transformer room. The range can be varied by using different electrolytes. An auxillary oil switch is connected across the rheostat so that it can be short circuited when it is not needed. The auxillary oil switch is controlled by a lever from outside the transformer room.

It will be necessary to enter the transformer room only when it is desired to change the position of the plug on the plug tap switch board. This should never be done when the oil switch is in, and for this reason the transformer room door is connected with the control mechanism of the oil switch, in such a way that the door cannot be opened when the oil switch is in, and also so that the oil switch cannot be closed when the door is open.

Taking Current to the Furnaces.

The current is carried from the bust-tie switch to the rear of the furnace by two conductors, each consisting of three 6-inch by ¼-inch bus bars, which go through the transformer room wall and extend down the furnace room for 28 feet at a height of 8 feet. These bus bars are supported from above by 1-inch steel rods. One of the conductors acts as a one-turn primary to two series transformers, which have the ammeters on the control switch board in their secondaries.

In front of the main bus bars, two masts of structured steel have been erected, which are pivoted at the top and bottom and provide channels in which two jibs operate.

These jibs are raised and lowered by two motor winch sets. Each jib carries a length of 6-inch by ¼-inch bus bar which has a copper cable bolted on the other end. The flexible cable terminates in a lug made of bus bars in such a way as to fit it between the three bus bars of one of the conductors described above, where it can be clamped by "C" clamps. With this apparatus electrodes up to 10 inches in diameter can be handled.

The experimental furnaces will be built on standard platforms of wood or sheet iron, which are made to fit a "Stue-Bing" lift truck, by means of which they can be moved about very easily. When they are to be operated, they will be run in under the jibs.

The Control Station.

The control station is situated on the outside of one wall of the transformer room, and carries an instrument board, a platform for precision instruments, and various switches controlling the motor winch sets.

The instrument board is of slate 38 inches by 42 inches and carries an indicating wattmeter, two indicating voltmeters, two indicating ammeters, an inverse time limit overload relay, and an integrating kilowatt-hour meter. Terminals are provided for connecting-in precision instruments, to check the switchboard instruments, and single pole, single throw switches for short circuiting the secondaries of the series transformers when the ammeters are not being used. The indicating wattmeter is pivoted so it can be made to face the operator, making it more convenient to read.

The inverse time limit overload relay is connected in the secondary of a separate series transformer that is connected in the high-tension wiring between the disconnects and the oil switch. It can be set to operate at different loads. When it closes, it operates the trip coil in the control lever of the main oil switch, which opens the oil switch, and also opens the 110 D.C. circuit that contains the trip coil and overload relay.

At different parts of the room, and also on the control station, are large push buttons, which are connected in parallel with the overload relay so the oil switch can be opened quickly from any part of the room in case of emergency.

In the lower part of the control station is a drum switch controlling one motor-winch set, by means of which one jib can be raised or lowered at two speeds. Beside it is a double pole, double throw switch, which controls the other motor winch set.

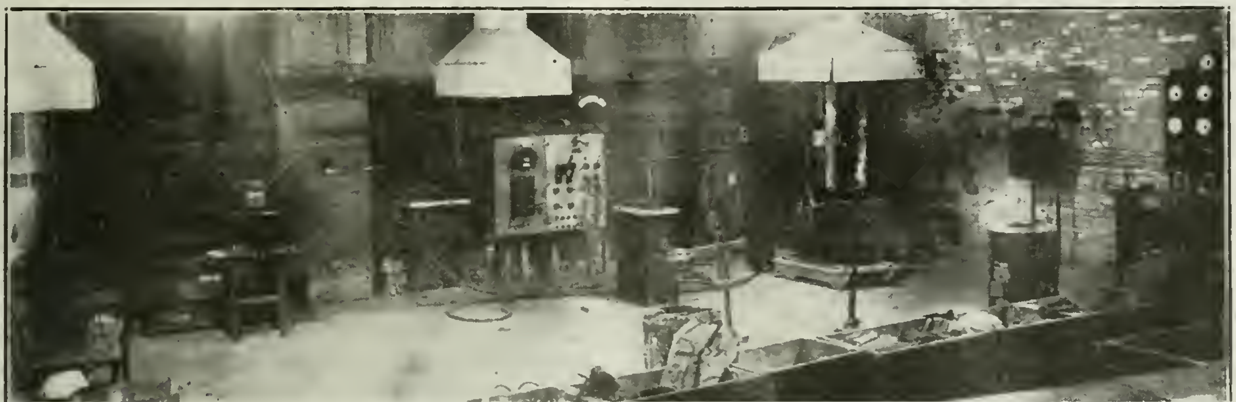
Special Equipment Provided.

A Thury Automatic Regulator of the improved B type has been mounted near the control station by means of which one electrode can be controlled automatically.

A special ventilating system has been installed in the furnace room, which has sufficient capacity to handle very effectively the copious fumes which are incurred when running arc furnaces.

A very useful addition to the equipment in the form of an Ajax-Northrup High Frequency Induction Furnace, with a capacity of 25 kv.a., is being installed at the present time under the direction of Prof. J. F. Burt-Gerrans. The transformer for this furnace will be supplied with power from the 200 kv.a. transformer described in the foregoing.

The photograph shows part of the new furnace room. On the right hand side is one wall of the transformer room with the control station, Thury regulator, bus-tie switch, two control levers for the oil switch, and part of the high frequency installation shown. Under the hood on the right is a small tilting furnace on a standard platform. The jibs and masts are in view, and behind them the motor winch sets. The main bus bars can be seen behind the hoods. The marble switch board and two rheostats are part of the direct current equipment.



Section of Electric Furnace Room, Department of Electrochemistry, University of Toronto.

THE GERMAN IRON AND STEEL INDUSTRY.

The abolition of official maximum prices and export control, as well as the discontinuance of the three per cent. export levy formerly charged by the German Government have given a decidedly improved tone to the markets during recent weeks. The "Phoenix A—G" is increasing its capital from 136 to 275 millions of marks in order to amalgamate with the Humbolt Machine Work at Cologne and the Rhenish Metalware and Machine Works at Dusseldorf, as well as for the purchase of ore mines. In the finished iron and steel market, the keen demand by foreign buyers for railway material deserves mention. Heavy steel rails are quoted at 2,200 marks per ton and rails for mines, including fishplates, 1,850 marks. Some foreign orders for sheets have lately been booked, but this branch, as a whole, is working short time. For wire, export orders are more numerous. A meeting of the Wire Convention of 1916 will be held shortly, when the break-up of the syndicate will probably be announced.

The German Copper Plate Syndicate has increased selling prices by 120 marks to 2,640 marks per 100 kilos.

The German Zinc Sheet Syndicate has increased selling prices to 815 marks per 100 kilos.

From Montreal to Niagara Falls by Way of Shawinigan, Ottawa and Toronto

An Advance Survey of the Trip

OUR visitors come from centres where industries of all kinds have been established for generations. What have we to show? They come to see, hear, and learn.

They will have passed under the Quebec Bridge; they will have seen the St. Lawrence and the noble Cape Diamond; perhaps they will have seen the Saguenay, with its sentinel capes, or the view from the Dufferin Terrace. Many of them may have seen those sights of the tourist before. They are not sightseers in the ordinary sense and they do not come simply to attend a meeting.

Their coming is the fulfilment of a long promised visit to the Canadian membership, but it is more than a matter of courtesy.

It is a recognition of Canadian entity in industrial chemistry.

The interest then will focus on development and power, and the itinerary has been well planned for this purpose.

They will see country, but late the home of the hunter and lumberer, now dotted with thriving industrial centres, transmitting power to distant cities.

Montreal.

Looking to the southwest from Mount Royal, if blessed with Montreal's usual clarity of air, Lachine Rapids may be glimpsed, the portal of that mighty series of powers forty miles long. They may think of the ships that will one day load with grain at Fort William for the Mersey, but they will not be reminded of it by Montreal members!

The powers on the St. Lawrence, the Ottawa, and the rivers round the Island of Montreal, make that city the centre for something like a million and a half horsepower. The St. Maurice Valley will furnish three-quarters of a million more, and the Canadian visit will finish at Niagara with an inspection of the great hydro electric works there.

Power will evidently be a lasting impression of the visit and what the mental comparisons of public and private ownership may be, we may hear later, for the visitors are the chiels to be taking notes.

The wisdom of removing port supervision from the exigencies of civic politics is well shown in the accomplishments of the Montreal Harbor Commission. Those who recall Montreal Harbor even ten years ago will note the change from temporary sheds, taken down each winter to escape the ice that surged over them every spring, to a permanent system of two-decked sheds on high level wharves with every modern device for handling import and export freight.

The Vickers Shipyards, the Angus Shops, the Canada Car and Foundry Company, cement plants, sugar and oil refineries, lead glass, enamelling and textile works are found in Montreal, each having points of excellence either in production, handling, or control, and most having technical men who would no doubt be glad to swap experiences with fellow technologists, as few Canadian industries are now run on the old basis of secretiveness.

Those who are interested in public affairs can look into Montreal's civic administration, the combination of British criminal and French civil laws, the present experiment in government control of liquor, and the toleration and broadmindedness of the two controlling nationalities.

Montreal is rich in stories of the past. The old city, from St. Denis to McGill Street, has many of the old mansions more or less modernized and incorporated into recent buildings. One of these old places, in a neighborhood associated with the fur traders, including John Jacob Astor, is now in use as part of a large drug and chemical works.

The Chateau de Ramezay, with its collection of historical relics, is in a district redolent of the past. This and the nearby Seminary of St. Sulpice strike a note of the old days under the viceroys of the Grand Monarque.

In addition to McGill University, our meeting place, there is the large University of Laval, named after the great Archbishop of the French regime.

There are two large technical schools, a commercial high school, and fine high and public schools under the Protestant and Roman Catholic Boards.

Christ Church Cathedral, the finest example of Gothic in North America, and St. James' Cathedral, a one-fourth reproduction of St. Peter's at Rome, are typical of the ecclesiastical architecture, while Montreal is very proud of its great banking offices, whose counting rooms are of striking beauty.

The Mount Royal Tunnel is a daring solution of the problem concerned with the fourth railroad entry into the city, and its construction afforded much valuable data on the interesting geological question of the origin of Mount Royal and the isolated hills of the Monteregian plain.

Leaving Montreal for Three Rivers and Shawinigan, the train runs eastward not far from the north shore of the St. Lawrence, crossing some of the old stage roads that wound in and out among the radiating, ribbon like farms of the old settlers, passing stone farm houses, twin-spired churches and the quaint villages of the habitant until the new-old city of Three Rivers is reached after about four hours.

Three Rivers and Shawinigan.

Three Rivers was founded in 1640 by Laviolette, two years before Maisonneuve established his settlement at Montreal. It was a very active place in the seventies and eighties as a lumber centre, but was becoming somnolent in the nineties, until the development of power up the St. Maurice, at whose triple mouth the city is built.

No stop will be made at Three Rivers for lack of time, but the visitors will there start north on the St. Maurice Valley Railroad for Shawinigan.

At Les Gres the train crosses the river and an undeveloped power. An interesting escarpment of sand hills here gives the falls its name, the Grey Nuns.

Shawinigan is one of the latest things in towns. Twenty-five years ago one house accommodated the population, the family of the Government log inspector. The nearest railroad was twelve miles away with one mixed train daily. The present population of 10,000 is served by two railroads and several trains a day.

Twenty-five years ago the only industry was that which required half a dozen men to pass logs down the chute

that saved them from being jammed in the gorge at the foot of the falls.

Today the party will find Shawinigan the home of a well organized section of the S.C.I., with a number of highly technical industries, metallurgical, electro-chemical and power plants, a huge pulp and paper mill, a modern technical school, a research laboratory, well paved streets, fine residences and a pronounced community spirit.

Grand Mere, fifteen minutes further, would well repay a side trip if possible, completing the trinity of towns in this interesting district, and emphasizing the development of the St. Maurice as the electro-chemical centre of eastern Canada.

Ottawa.

Returning by way of the Ottawa Valley to the Capital City of the Dominion, the path of early progress is closely followed. The whole country is rich in history and is now building up its industries as well.

Villages but recently emancipated from stage coach connections are on this line: Hunterstown, which had a coinage of its own in the fifties, is one of these. Here a few New England families interested in lumber had at that time quite a gay social life. There is much of an almost forgotten charm about all these back villages of the north shore.

Ottawa is becoming a typical parliamentary city. Its one great industry, apart from speechmaking, was, until a few years ago, lumber; in fact, it is today. The modern pulp and paper mills, match factory, and packing house are in Hull, across the river. They derive their water power from the Chaudiere Falls of the Ottawa.

Interest centres in the group of parliamentary buildings, the experimental farm, the food and drug laboratories, the laboratory of the mines branch, and the mint.

Ottawa has one of the finest park systems of any Canadian city, and was the first Canadian city to have electric street cars. Here the first convention of Canadian chemists was held in the spring of 1918, when steps were taken which resulted in the formation of the Canadian Institute of Chemistry.

Few evidences remain of the destructive fires that have destroyed portions of the city in earlier days, and more recently the main House of Parliament. The new Parliament Buildings, erected in the same location, are a credit to the Dominion, and an interesting study to the visitor. Here in the Hall of Fame along with the records of prominent leaders in public life, will be enrolled the name of every Canadian soldier who served his country in her time of need.

The selection of Ottawa as a capital for the Dominion has turned out to be a most happy choice although at the time there were few apparent reasons for placing it in a lumbering village to which access was most difficult.

Ottawa is located at one end of the Rideau Canal which history records as having been built for military purposes under the direction of Colonel By. Ottawa was for many years known as By Town. The military purposes which at that time made it necessary to avoid the St. Lawrence River in reaching Lake Ontario, are happily long since passed away. The canal remains one of the most delightful of Canada's inland waterways with its lakes and winding rivers. Ottawa has been referred to as a lumbering centre. The activities of its lumber kings mark the height of individual effort in the development of the industry in Canada. One citizen of Ottawa, J. R. Booth, built a railway from the Georgian Bay to the United States boundary below Coteau Junction as a private effort, in connection with his lumber business. On the Ottawa River below the city at Hawkesbury, are situated large pulp and paper mills, while the only phosphorus reduction plant in Canada is situated at Buckingham on the north side of the river. Ottawa is the geographical centre for the production of Mica, Magnesite, Graphite and Molybdenum in Canada, although there are no plants immediately in the vicinity.

One of the largest metallurgical developments since the war is the completion of the new refining plant of the British America Nickel Corporation at Deschenes, a few miles above the city.

Through Central and Southeastern Ontario.

Leaving Ottawa for Toronto, the first half of the trip is occupied in passing in a diagonal manner across Central Ontario. This whole district from the eastern end of Lake Ontario to the Ottawa River is known to contain large resources in such industrial minerals as marble, feldspar, mica, etc., and has produced some gold before the more striking discoveries in Northern Ontario were made. The country has been lumbered over for a generation, and the nature of the soil and rock does not allow for continuous farming in some parts. Its lake regions are well known to tourists, but in a country where such an abundance of outdoor life and the beauties of Nature may be had has not received the same attention as portions of the Province of Quebec and Muskoka closer to the larger cities. The north shore of Lake Ontario is reached at Belleville, and once again you come to some of the oldest settlements in Upper Canada. The historic city of Kingston, with its well known university, Queens, is but a few miles to the east on the lake, and just beyond Kingston the lake empties into the St. Lawrence through the famous Thousand Islands long known to Canadians and Americans alike, from their natural and developed beauty.

Between Lake Ontario and Montreal as much water power is available as between Lake Erie and Lake Ontario, and at the present moment the development of this power and the opening of these upper lakes to ocean navigation, is one of the problems before a joint commission of the two countries concerned. Some of the estimates run to four million horsepower. A number of small but growing cities and towns are spaced along the north shore of Lake Ontario, and are now served by three trunk railways, where but a few generations ago they were served by small lake boats and the Kingston Road, a highway for oxen, horses and the militia. At Trenton, the British Chemical Company erected one of the largest of Canada's munition plants, now adapted for the manufacture of acid phosphate fertilizer. and other chemicals. The chemical industries of the north shore are not numerous, but are essential. At Corbyville, Canada produces her supply of industrial alcohol. The only dyestuff manufacturing plant in the Dominion is at Trenton, as well as a plant for treating railway ties with creosote. From Madoc comes Canada's contribution to the talc trade, while one of the largest refineries for the production of cobalt, arsenic and silver is located at Deloro, a few miles inland. At Port Hope another chemical company produces a complete line of lacquers, enamels, refined fusil oil and amylacetate.

Toronto.

Toronto lacks something of the antiquity of points in Eastern Canada, and there are fewer evidences of an historical past. None of the traditions of Quebec are to be

found here. French is not heard in its streets, and while smaller than Montreal in total population, it is the largest English-speaking city in the Dominion. While its many and highly specialized manufacturing industries employ many chemists and use large quantities of chemical materials, it is not particularly a chemical manufacturing centre. From the viewpoint of visiting chemists, the university with its fine location and ample grounds, buildings and laboratories, offers some attraction. The University possesses several buildings in which chemical research is being carried on and the number of students in attendance exceeds that of any other university in Canada. The city is possessed of a splendid natural harbor which is being greatly improved with a view to possible developments in the St. Lawrence. Power is supplied from Niagara Falls for general manufacturing and domestic purposes, and the development of the province as a whole has greatly stimulated the growth of its chief city. Visiting Toronto around September 1st means visiting the Canadian National Exhibition, which is a most remarkable development of considerable industrial importance. During the two weeks an average of one million people have visited the Exhibition during the past few years and, beginning last year, a chemical section was established, allowing manufacturers of chemicals, special equipment, dyestuffs, etc., to display goods and meet visiting chemists. The situation of these grounds on the lake shore is most pleasing.

The Garden of Canada.

Between Toronto and Niagara Falls a regular steamship service carries the summer traffic. After two hours the mouth of the Niagara River is entered with no indication that a very few miles above are whirling rapids and the famous Niagara. On the left hand side is an American port of historic value only, and on the right one of the early seats of government in Ontario. Space might be devoted to the geological, historical and industrial side of the Niagara Peninsula with considerable interest, but only a few outlines may be given. Originally there were three falls in the river, but owing to the nature of the underlying rock, all three united in the course of centuries, leaving a canyon and a straight drop of some 160 feet. Broadly speaking, a high escarpment runs from New York State across the river and around Lake Ontario by way of Hamilton, disappearing through central Western Ontario. The river coming over this escarpment after the level of Lake Ontario had been lowered, made possible the present power canals. The escarpment itself changed the value in land at its base by several hundred dollars per acre. This strip is the Garden of the Eastern Dominion, producing the various fruits for which the district is noted.

Navigation is maintained through the Welland Canal, which has now been built and rebuilt four times since 1827. The last work, just now being finished, places several towns along its course in possession of a deep water way even better than those on the lake shore. At the northern end of the old canal, power plants have been built and as all the fall is in a short length, it is not impossible to conceive that the whole of Lake Erie might be turned into canals across the peninsula, each contributing its quota in water power. Within the last few years the towns and cities in the district have expanded tremendously, from Hamilton to the United States border. This is generally true for the cities of Western Ontario, where Niagara power has been introduced. In the immediate district on the Canadian side are located a nickel refining plant, paper mills, abrasive plants, a synthetic nitrogen cyanamide and fertilizer plant, cement and potash plant, silver and cobalt refining plants, iron furnace and a large number of manufacturing plants less directly connected with chemistry and metallurgy.

Hydro Electric Power Development at Niagara.

The most recent undertaking in the development of power at Niagara is that of the Ontario Government through the Hydro Electric Power Commission. A canal has been dug around the city of Niagara Falls from a point four miles up the Chippawa River to a point below the rapids. This involved tremendous expenditure and labor in rock excavation, but the net result was a drop of 300 ft. instead of 160 ft. as at the Falls, and the development at that point of 300,000 horsepower when required. Under the plans of the Government this is to be sold at a price sufficient only to cover cost and maintenance, and is thus as cheap as any available power for private manufacturing. The length of the canal is 12¾ miles, of which, 8½ are excavated. The deepest cut is 145 ft. and the rock section averages 48 ft. The estimated cost is $40,000,000.

In our inability to cover properly the chemical industries of the Dominion, we have chosen to describe briefly those in the path of visitors taking the trip outlined following the Convention. In general, providing tariff factors do not interfere unduly, Canada should be a good location for a number of chemical industries, chiefly those using electric power and current in large quantities. The development to date has been most remarkable, considering the scattered field and the total population. If her agricultural areas are rapidly filled up with settlers, her manufacturing industries will likely more than keep pace, and the result should be the gradual establishment in a fairly large way of many special plants. In the nature of things, Canadians will not long import an article if it can be made here at all. This is even more true of basic commodities than it is of everyday essentials purchased by individuals. Capital is continually searching import statistics for just such opportunities. Each province is blessed with important resources, and nothing short of a trip from Halifax to Vancouver with some time for investigation along the way, would suffice for a complete appreciation of the development of chemistry in Canada in all its phases. Canada has the climate and the resources in agricultural lands, minerals, coal, iron and power which, when developed, will be more than sufficient for a very large and vigorous nation.

GERMANY ADVANCES FERTILIZER PRICES.

The German Government has authorized advances in the price of nitrogen fertilizers as from June 1 as follows:

	Former price per kilogram. Mks.	Present price per kilogram. Mks.
Sulphate of ammonia	12.00	14.50
Muriatic ammonia	12.00	14.50
Soda nitrate	15.00	17.50
Calcium cyanamide	10.70	12.90

Output of nitrate is on the increase and a larger tonnage will be at the disposal of farmers than during the past year. Only 10 per cent. of last year's production found its way abroad. Prices for superphosphates have been reduced from 10.70 marks to 7.10 marks, mainly owing to Government subsidized imports of crude phosphates.

Operations of British America Nickel Smelter and Refinery

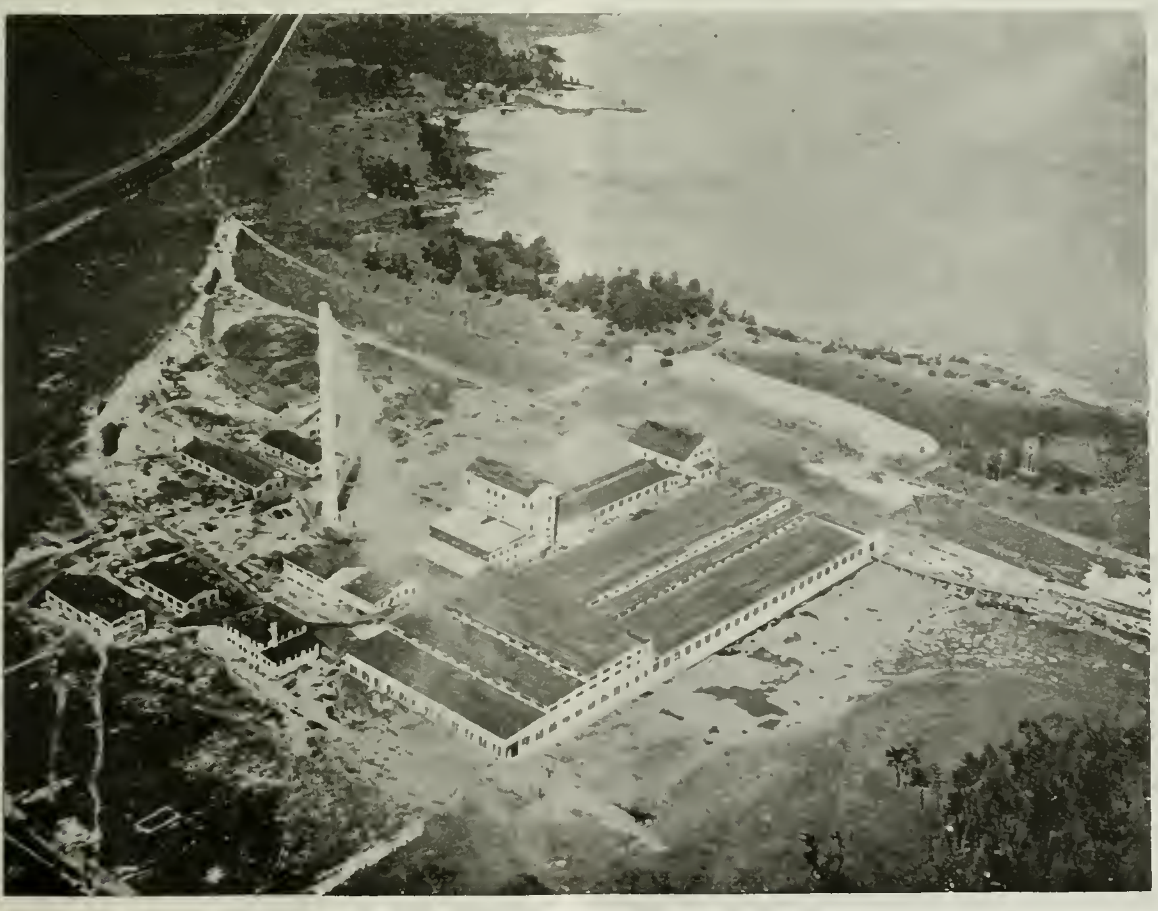
NICKEL production is a noted Canadian industry, which has received marked attention and development within the last few years. The completion of the refinery of this company, at Deschenes, Quebec, is one of the largest metallurgical developments carried through since the war.

Canada remained for a long time a producer of nickel copper matte, but not a producer of pure metal. The plant of the International Nickel Co., at Port Colborne, made the industry complete in Canada; and now the British America Corporation have added a second refinery of large capacity. The early struggle of the nickel industry is fairly well known. If we had been as wise to begin with, as we are now, several chapters in the story would not have been written; but, as the net result places Canada in a leading position in this metal, the situation, from the national standpoint, is satisfactory.

The Murray Mine, although recently developed, can easily supply 1,200 to 1,400 tons of mixed ore per day, and 2,400 tons have been lifted in two shifts. About 20 or 25% of this goes to the dump and the smelting ore goes to ore-bins. On each of five levels, a five-ton Westinghouse locomotive, with Edison storage batteries, operates four-ton ore cars. On each level, a motor-generator set charges the batteries on the third shift.

The Smelter.

The Power House is equipped with six 1,000-h.p. Babcock-Wilcox boilers, working at 180 pounds' pressure. In the blower room are four turbo-blowers, 3,600-r.p.m., each directly connected to a steam turbine, blowers and turbines being the Rateau-Battu-Smoot design and built by the Dominion Bridge Co., Ltd., Montreal. Two of the blowers each deliver 30,000 cu. ft. free air each at 36 oz. for the blast furnaces, and two 36,000 cu. ft. each at 12 lb. pressure to the converters, the steam turbine for each of these being 2,200 h.p. Each turbine has its surface condenser complete in every detail with centrifugal pumps for returning the hot condensing-water to a cooling pond. One unit comprises a 1,100 h.p. turbine, driving one of the blast-furnace blowers, and a 550 k.w. generator, used when the Wahnapitae power fails, which can be used as a motor to direct-drive one or both blast-furnace blowers. On account of the highly superheated steam, 590 to 610 deg., it was found necessary to fit the steam governors of all the turbines with monel-metal parts, which has proved very satisfactory. After a considerable period of adjustment this blower plant is now running very smoothly. Two Westinghouse motor-generators, one 300 k.w. and one 250 k.w., as a reserve, supply d.c. current to the motors of the electric locos, cranes and converters in the smelter building.



View of Refinery at Deschenes, Quebec, British America Nickel Corporation.

At Pump Lake two vertical motor-driven centrifugal pumps with steam reserves, supply the water to the mine and smelter, at the last-named of which is a powerful steam fire-pump for the protection of all the property.

In the Smelter building are two blast furnaces, 50 x 360 inches at the tuyeres, and a third is on the ground. On a strongly constructed crucible, 24 inches high, stands the single row of steel water-jackets, 14 feet long, 30 inches wide, inner plate ⅝ inches, outer ⅜ inches, with a water space of 5 inches. There are two 4½ inch tuyeres in each jacket or 24 on each side of the furnace, which is tapped at either end, using a water-cooled cast-iron spout for discharging into a settler 20 feet by 30 feet by 5 feet, lined with chrome and magnesite bricks, there being three settlers in all. The matte tap-holes (4) at first gave much trouble, but a syphon tap, invented by Mr. J. H. Gillis, chief engineer, solved this difficulty.

On the charging floor, standard-guage tracks on each side of the furnaces, lead to the supply bins and a specially designed type of charge car drawn by electric trolley locos gives great satisfaction. Each car is divided into four 4-ton compartments discharging one side into the four feed openings of the furnace, while in the centre of the other side is a multibeam weighing device with which the proper weights of coke, ore and flux can be weighed into each section through the valve gates in the bottom of the supply bins.

In the converter aisle are two 60 feet span, 40-ton electric travelling cranes, serving the three Pierce-Smith basic-lines converters 13 feet by 30 feet, each with forty-four 1½ inch tuyeres, electrically rotated. Steel ladles holding 20 tons of matte, or 12 tons of converter slag, are used, and the holes soon made in these by the corrosive matte are now very successfully repaired by fitting in pieces of steel plate by Thermit welding. A hopper, holding 16 tons of flux, fine ore or gravel, is placed by the crane on a Kron weighing device, at the end of each converter, where a weighed charge can be blown in with the Garr gun. The fourth converter is on order, the furnaces and converters having been supplied by the Canadian Allis-Chalmers Co.

Smelting Practice.

This practice has many features different from that followed by the other smelters in the Sudbury District. The ore averaging SiO_2 24 per cent., Fe 35 per cent., CaO 3.7 per cent., MgO 4.3 per cent., Al_2O_3 6 per cent., S. 19 per cent., is smelted without any preliminary roasting and the only flux used is converter slag containing SiO_2 16 per cent., Fe 52 per cent., CaO 3.5 per cent., Al_2O_3 3.5 per cent., the charge consisting of 70 to 75 per cent ore, the balance flux with 10.5 per cent. coke on the charge. The resulting slags contain SiO_2 35.5 per cent., Fe 30 per cent., CaO 5.5 per cent., Al_2O_3 13 per cent., and 0.24 to 0.34 per cent. Nickel plus Copper plus Cobalt.

The low-grade matte from this furnace, containing 11 to 13 per cent. nickel and copper is poured into the converters, and blown up to the usual matte containing 80 to 82 per cent. copper and nickel and a trace of iron, which is transferred to an oil-fired furnace, and in running from thence through a strong stream of water is very successfully granulated, then wheeled into box cars and shipped to the refinery.

In the converter method, the flux mainly used is ore fines with some siliceous gravel or sand. One aim is to keep the silica in the converter slag as low as possible, it often averaging for days under 13 per cent., which eventually will become the regular practice. This slag is poured in part into large 20-ton cars, poured outside the building onto shallow beds lined with ore fines, broken up and lifted by locomotive cranes, using clam-shell buckets and sent to the smelter bins. Part of the slag is poured into the settlers.

The capacity of the blast furnaces is proving much greater than anticipated, as for the past three months, one furnace has averaged over 800 tons of ore per day, and 1,015 tons of ore have been smelted in one day, counting in the ore used as flux in the converters. In the future, greater results will be achieved, especially if the ore fines under 1½ inches now going to the furnaces are sintered, a problem now being studied. The amount of flue dust is small, being caught in the dust flues and chambers. The smelter stack is 300 feet high and 25 feet inside diameter.

Railways.

The company's railway system at these plants connects with the Canadian Pacific and Algoma Eastern railways, and is equipped with the necessary standard locomotives and rolling stock.

Refinery.

Situated on the C.P.R. at Deschenes, Que., near Ottawa, where cheap electric power was available, and other advantageous factors existed, such as an excellent site, water and sufficient labor.

This plant has a capacity of 15,000,000 lbs. of nickel per annum, and at a comparatively small expense can be increased to from 20 to 24 million pounds. This metal is deposited electrolytically by the Hybinette process and a very high grade product is being produced, containing practically no impurities but a little iron and copper and some hydrogen.

The matte from the smelter passes through two Wedge roasters, each with 8 hearths, and thence to the leaching department, where the copper in part is dissolved with H_2SO_4 and plated out in the electrolytic tanks, the cathodes being melted down and cast into 81 lb. ingots: about 55 tons of copper being produced per 100 tons of nickel.

The leached matte with fluxes is then smelted in especially designed electric furnaces using 24 inch circular carbon electrodes, and nickel copper anodes, weighing 200 lbs., are cast in steel moulds. These furnaces, which are proving a signal success, were designed by Mr. Ivar Hole, a Norwegian metallurgical engineer. These anodes then go to the nickel depositing building which covers three acres, and not only is the nickel plated out, but a large amount of nickel-sulphate and also nickel-ammonium salt is being produced for sale to the nickel-plating industries.

The slimes remaining after the nickel anodes are dissolved are collected and concentrated, and will be refined in the precious metals department to yield metal-platinum, palladium, iridium, rhodium and some gold and silver.

In the power sub-station is a very fine electric installation, supplied by the Canadian Westinghouse Co., comprising with transformers, etc., five rotary converters of 4,000 amperes each, three with a range of 70 to 290 volts on the D.C. side. There is also a reserve 1,000 k.w. generator driven by a steam turbine, there being two 1,000 h.p. B. & W. boilers equipped with superheaters, Green's economizers and forced draft.

Fuel for Canada---a Problem in Transportation

Residues Remaining After Reading Reports of the Fuel Committee, Ottawa

By THE EDITOR.

CARRYING coals to Newcastle was always a figure for superfluous action, but recently a ship load of coal from China has been delivered in England. The general situation in Europe hinges in a great measure on control and supply of coal. There are some countries that have neither coal supply nor water powers of any magnitude. Strikes may be settled but coal cannot be created by order of either the unions or the Government.

So far as quantity is concerned, Canada has neither a fuel problem nor a power problem. Transmission, transportation and application are her problems. Coal is portable and storable fuel, and electricity is portable, but not storable, power. Coal is an economical source of power; electricity is not an economical source of heat. With both available and used at reasonable efficiency, each should be kept for the purpose it serves best, dependent upon relative costs and special circumstances. Coal is seldom applied at an efficency of more than twenty to thirty per cent. either for power or heating, and therefore in many cases for small installations, electricity can be used economically; but the power-heat ratio is so great that any larger demand for heat would soon over-tax the transmission lines. For this reason, we are compelled to get the great preponderance of our heat in portable and storable forms. Oil is coming into use in many ways, but must still be regarded as a subordinate.

The strain on the world's oil supply is seen in the rapidly increasing number of large trade and war-ships burning oil. The writer has recently seen a battery of eight Babcock and Wilcox boilers equipped for oil burning in a pulp and paper-mill, to use about six thousand gallons of oil daily. It is stated that the cost of oil will be slightly higher than coal, but the difference is so small that the intangible superiorities of oil were considered sufficient to offset it.

Wood and peat can only be used locally; coal is the world's great fuel, and will be for generations to come.

Our Government was well advised to have the matter thoroughly considered. The manner and means of doing so may be open to serious criticism, but, in any case, much valuable data and the benefit of widely varying experience has been bottled up for our ingurgitation. Much of it is good medicine, and some of it is dope—nearly all of it available in better shape without any parliamentary committee.

Present Limits to Use of Canadian Coal.

The dead lines for Canadian coal seem to be Port Arthur on the Eastward carry from Alberta, and Montreal on the Westward carry from Cape Breton. The area between, practically the entire Province of Ontario, is dependent on the United States both for industrial and domestic uses, owing to the high transportation charges beyond those dead lines. Pennsylvania coal can be bought to-day at the mine for \$2.25 to \$2.50 for steam (bituminous), and \$7.00 to \$8.00 for anthracite, but it costs about \$3.50 (for anthracite) to get it to Buffalo; another \$1.50 for exchange; fifty cents to transport to Port Arthur by boat, and more from Buffalo to Montreal, because the carriers are smaller.

Beyond these points, after handling and delivery, (which in the average city will be about \$2.50 per ton) the price of anthracite approaches nearly the cost of the estimated equivalent in electricity. The writer was told by a hydro-electric engineer not so very long ago that, when coal approached \$20.00 a ton at Montreal, it would be feasible to consider the heating of homes with electricity. Anthracite coal was meant in that connection, however, and Mr. Harrington now tells us that we must expect little anthracite for Canada from the United States in ten years hence.

Officials of the United States Fuel Administration estimate that the anthracite field will hold out for some centuries at the present yearly output of about ninety million tons. The seams are getting thinner, and every year it costs more to win the coal, which now costs at pit-mouth more than twice as much as bituminous.

For economical reasons, therefore, and to utilize our own resources, we should consider the question of domestic use of bituminous coal, either as mined or after coking. For this, the prices at pit-mouth are: In Alberta, \$5.25; in Nova Scotia (Sydney), \$6.50. Against these, there is a pit-head price of \$2.25 to \$2.75 in Pennsylvania, plus freight to Buffalo or Suspension Bridge, about \$2.50, and exchange about sixty cents; boat charges to Port Arthur, fifty cents—making a total of \$6.00 to \$6.50 on boat at Port Arthur, plus fifty-three cents a ton duty. Nova Scotia coal, which costs about \$8.00 when it gets to Montreal, practically breaks even at that point with Pennsylvania coal by reason of the duty of fifty-three cents per ton.

Deep Water Route Needed.

It is quite apparent that until coal can be shipped in large boats, and not break bulk until Toronto or Hamilton is reached, Ontario will continue to receive its coal from the United States. It is a good point in practical economy to use outside resources, if costs are less or equal, and conserve one's own resources until the cost curves change places. There is no advantage in quantity production of Canadian coal to supply districts which can obtain coal at lower rates elsewhere; but there are advantages in developing our own resources to assure economic independence, and, therefore, we shall hopefully look to the report of the committee on fuel supply. Ere long, may we not expect to see greater effort made to increase the uses of byproducts from bituminous coal? At present there is an enormous waste in burning the volatile constituents under steam-boilers with a delivered efficiency of about twenty per cent.

Our grandfathers, our fathers, and even our settlers to-day burned up and are burning up millions of feet of standing timber, considering it an encumbrance to the soil. We feel bitter about it, but continue burning what we call "steam-coal," when we ought to call it: "dyestuff, medicine and chemical coal," in much the same way, because we lack population and outlets for its use. It is impracticable to save it now, but it is worth while considering when we should begin.

If we could gradually introduce the use of coke for steam purposes and domestic use, we should be preparing

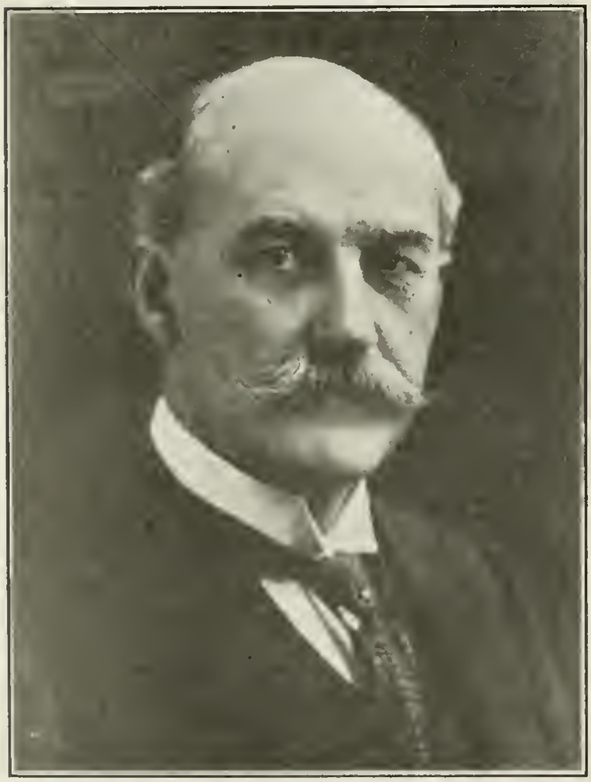
for it. The supply, though great, has a limit, and becoming more costly every day in human life and money for its extraction. Some of the Nova Scotia workings are two miles from the shore line under the sea, and the Alberta coal is difficult to mine in upper levels, owing to crumbling roofs.

All these facts entail an educational duty on those who know them. Chemists and engineers can help by introducing better control in steam-plants. Municipal authorities might aid considerably by introducing and making practical plans for central station heating. Many cases where a little heat is required in a short time can be covered better and at lower costs by electricity than by coal. Our growing hydro-electric development should shortly render an increased area subject to electric haulage where the greater tractive power and more satisfactory working of the electric locomotive would reduce transportation costs.

One of the chief items in hauling of coal by rail is the coal required to haul it.

We hate to keep harping on the point, but if our drowsy senators could properly visualize the research institute, they might see that the proper use of coal is at least as important as the control of its price by boards.

Our railway trackage is twenty-five years ahead of our population. We pay the difference between profitable operation and cost out of taxation, and are asked to keep our eyes on the horizon—note the orient sun of progress ——foot the bill—and—wait. Why not plan our use of resources on a less altruistic but more practical scale? We may have fewer such millionaires as our railroad construction produced, but we may keep our taxes tied a little closer to earth.



DR. ANDREW McWILLIAM, C.B.E.

Dr. McWilliam is a graduate of the Royal School of Mines, London, and joined the staff of the Sheffield Technical School and at the same time was Chemist and Steel Manager of the Martino Steel Company. After a short term as Manager of the danger area of the British Explosive Syndicate, he was appointed Lecturer and later Assistant Professor of Metallurgy at the University of Sheffield. Dr. McWilliam spent six years in India as Metallurgy Inspector for the Government of India and is at present engaged in private practice in Sheffield.

He has contributed a great deal to the present knowledge of micro-structure of steel and shares with Arnold in the discovery of Widmannstatteh figures in steel castings.

In December, 1919, he was made a C.B.E., for pioneer work on the establishment of the heavy steel industry in India and its later application to war work, and in January of this year, was elected President of the Sheffield Society of Engineers.

PROF. J. W. McBAIN, M.A., Ph. D.

Prof. McBain is a Canadian, being a graduate of Toronto University, from which he graduated with first class honors in 1903. He took post-graduate work under Ostwald and Bredig at Leipzig and Heidelberg, from which latter University he obtained the degree of Ph. D He was appointed Lecturer in Inorganic and Physical Chemistry at the University of Bristol and later to the chair of Physical Chemistry endowed in 1919 by Lord Leverhulme.

Prof. McBain's principal work has been on absorption, the dissociation theory, dental amalgams and soap. Among his other activities, he is Vice-President of the Association of University Teachers of England, Wales and Ireland, and during the war was engaged for nearly four years in the Training of Officers, being mentioned for valuable services.

Alcohol---the Important Part it Plays in the Industries of the World---Its Position in Canada

By P. A. HILL*

THE Governments of the most progressive nations of the world realized many years ago the important part that Ethyl Alcohol, both pure and denatured, would play in their fight for industrial supremacy, and fostered, in every possible manner, the manufacture, distribution and use of Industrial Alcohol in the manufacture of over 150 commodities, also as an article of general utility for light, heat and power, in the hospitals, homes, garages and institutions of learning, by passing the necessary legislation which made alcohol free of taxes and restrictions when it was to be used in the industrial progress of the nation.

Let us first consider what Germany did along these lines. In 1887 Germany removed all taxes on Ethyl Alcohol used for industrial purposes, at which time there was consumed 8,215,842 gallons. This stimulus increased the consumption to 18,967,765 gallons by 1894. Again in 1895 that country went a step further and gave a bonus to the manufacturer of industrial alcohol. This bonus was paid from the taxes collected upon such alcohol as was used for beverage purposes so that by 1901-2 Germany was producing 112,010,200 gallons per annum. The growth and development of such an industry made possible her famous dye manufacturing and chemical industries, also the innumerable low-priced articles of commerce that were being distributed to the far corners of the globe. Nor did the influence of the alcohol industry stop here. It was not only instrumental in materially enhancing that country's agricultural worth and resources, but placed Germany in a position when, at any time she chose, she could become independent of the United States, Mexico and Russia for her supply of petroleum products, through the growth of crops convertible into fuel.

The history of the alcohol industry in the United States is somewhat similar to that of Germany. In 1907 the United States Government passed its tax-free alcohol bill, at which time there was only 1,780,276 wine gallons of Ethyl Alcohol used for industrial purposes. In 1918 the production had increased to 50,163,016 wine gallons. (These figures apply to denatured alcohol and do not include the vast quantity of pure Ethyl Alcohol that is used annually in the production of pharmaceutical preparations, patent medicines, essences, etc.) In the year 1918 it is estimated that 52,490,000 proof gallons of pure Ethyl Alcohol was used exclusively for the manufacture of explosives and other war purposes.

France is also a large alcohol producing nation. Statistics show that in 1916 there was produced in that country 33,600,000 gallons of alcohol, which was used in many of its large industries.

In Great Britain, during the year ended March 31st, 1918, the consumption of tax-free alcohol for manufacturing was 5,062,500 imperial gallons. The quantity of pure Ethyl Alcohol used in connection with the arts and manufacturing was 16,123,636 imperial gallons, which was nearly all used in connection with the requirements of the Government for munitions and other war purposes. In former years the production of Ethyl Alcohol for industrial purposes in the United Kingdom has been limited, but now plants are about to be constructed which will increase the production by many million gallons per annum. The output of these plants will be devoted not only to general manufacturing, but also in the production of motor fuel.

*Sales Manager, Canadian Industrial Alcohol Co., Ltd., Montreal.

Industrial Alcohol in Canada.

The use of Ethyl Alcohol in Canada for industrial purposes up to the present time has been limited. Although alcohol is used as a basic material and as a solvent in the production of over 150 commodities, the demand in Canada for most of these articles is limited on account of our small population, thus the investment of capital into factories and equipment necessary to produce those articles has not been warranted, but now that our manufacturers have evidently entered the export markets of the world, permanently, they should investigate and consider the manufacture of one or several of the many commodities which are not manufactured in Canada at the present time, and in which alcohol is used as a basic material or as a solvent.

For many years the sale of Methylated Spirits (known also as Denatured Alcohol) in Canada was controlled by the Department of Inland Revenue. In 1920 Parliament enacted that such sale should be placed in the hands of the distillers, and also provided that additional formulae of denatured alcohol should be approved from time to time to suit various industries, which, on account of former restrictions, were compelled to use pure Ethyl Alcohol, on which they paid excessive taxes.

Thus Canada has taken a step forward, but there is still a lot to be done if industrial Canada is to be placed on a footing with other countries. Most important of all is—that the people of our country, and more especially our legislators, must realize that the principal use of alcohol is for manufacturing. The universities of Canada, which are recognized throughout the world as being amongst the foremost of the higher educational institutions, turn out annually several hundreds of trained Chemists, Doctors and Engineers. There is no reason why Canada, armed with the technical knowledge of such men, does not in the near future take a prominent place industrially amongst the large nations of the world. This result can be accomplished when it is fully recognized that tax-free alcohol is a necessity in the manufacturing life of our country. We should also endeavor to interest the foreign manufacturers in establishing branch factories in Canada for the manufacture of their product. The benefits they would derive from such action are many, the principal one being that as Canadian manufacturers the doors of the British Empire are open to them, and they would receive the benefit of the preferential tariff which exists for promotion of trade within the Empire.

The potential production of alcohol in Canada is far in excess of the demand, the Canadian Industrial Alcohol Company, Limited, being the largest producer. Its refinery, located at Corbyville, Ont., has a capacity of 6,000,000 gallons annually, and having full confidence in the future of industrial alcohol in this country, provision has been made that the capacity can be greatly increased.

Chemistry in New Fields

The Lime Manufacturer.

The National Lime Association of the United States held a four-day convention in New York in June. Over one hundred lime producers were present. These meetings amounted to discussions along two main lines—business and chemistry. Lime producers in the United States are more numerous than in Canada and the industry as a whole has grasped a few modern ideas along chemical engineering lines and are applying them properly. Canadian lime producers, outside of those who produce lime in connection with some chemically controlled industry, are not yet awake to the chemistry of their business. The Association has a laboratory at Washington in charge of Dr. M. E. Holmes, and his publications are helping the industry very largely. One paper of general interest and available is "Outline of the Process of Lime Manufacture." Another is being prepared on the distribution of lime in agriculture, construction and over one hundred chemical industries.

Kiln efficiency, like everything else, consists in chemical control. The alkali manufacturers using the ammonia soda process, and among the most efficient producers of lime, about 1.2 tons of limestone, are required per ton of soda ash. They use 60 to 70 ft. limekilns with an internal diameter of about 10 ft. They are operated under induced draft with coke, the fuel being charged with the stone. The ratio of coke to stone and size are important. A six-inch cube is normal, maximum size of stone and 2½-inch for the coke. The correct ratio is determined by analysis hourly and temperatures taken with recording pyrometers. With high calcium free burning stone and coke, low in sulphur and ash, fuel ratios as high as 1 ton of coke to 12 or 13 tons of stone are obtained over monthly periods. A kiln efficiency of 96 per cent. may be had, the standard being ideal combustion and burning in a continuous plant.

Arthur D. Little put it right when he said that 60 per cent. of the lime market was due to science and chemical research. Improvements will follow from the application of proper chemical principles and an expansion of the market will come by education of the user. Water purifaction and water works may yet become large users of lime. At present about 120 such plants in the United States consume 55,000 tons. There are still problems for the limemaker. It was pointed out that one lime similar in chemical composition to another may absorb 25 per cent. more chlorine in making bleaching powder.

That the chemist and chemical engineer is needed by our lime companies is indicated from following problems; methods of firing, kind of fuel, insulation of kiln, principles of regeneration, size of kiln, method of charging stone and cooling lime, utilization of carbon dioxide and the production of various grades for specific purposes.

The lime manufacturer must carry his research work right through until it develops into service to every individual consumer and user.

A Canadian Shark Industry.

The United States has a shark industry already established and there is a move to start something of the same kind in Victoria, B.C. The sharks are present in the Gulf of Georgia and one company has caught 80 during one week. Norway has a flourishing shark industry which after the catching is accomplished, develops into a type of chemical industry. Some of the by-products which may be developed under chemical control are: "Cod Liver Oil" glue, fish meal, fertilizer, glycerine, ornaments from the teeth, and fancy leathers.

DR. FREDERICK WILLIAM ATACK, B.Sc., (Lond.), F.I.C.

After graduating from the University of Manchester in 1912, Mr. Atack obtained the degree of B.Sc. from London. Since graduation, Mr. Atack has been engaged in research work, principally on dyes, and is at the present time Director of Research and Chief Chemist to the British Alizarine Company. Mr. Atack is Editor of the Chemists' Year Book, which is now in its Sixth Edition, and has published numerous Text Books on Chemistry, including many valuable translations on Organic Dyestuffs. In January of this year, Manchester University conferred upon him the Degree of Doctor of Science.

NEW AMERICAN COPPER CONTRACT.

The New York Metal Exchange has adopted a new form of copper contact, whereby the purchase and sale of standard copper will come under the same conditions of delivery as on the London Metal Exchange.

It was intimated some time ago that this action would be taken and, according to opinion in the trade, the new form of contract has been adopted in an effort to transfer price control of the metal from London to New York, especially in view of the fact that a great part of the world's output comes to the United States. In addition, it is hoped that more general trading will be encouraged in the New York market, thus keeping much of the American business which goes to London.

As the two contracts of delivery will now be the same, it will now be possible to establish arbitrage operations between London and New York.

ROBERT F. RUTTAN

President Elect, Society of Chemical Industry

ROBERT FULFORD RUTTAN was born at Newburgh, Ontario, July 15, 1856. He prepared for the University of Toronto, at Napanee Collegiate Institute, graduating in 1881, after obtaining the Gold Medal in Natural Science. He entered McGill, taking the degree of M.D., in 1883. Following this, he went to Germany, where, at the University of Berlin, he carried on post-graduate work in Chemistry, under Prof A. W. Hofmann. Returning, after two years, he became a member of the College of Physicians and Surgeons, in 1884, but confined his activities to University work and Chemistry. From 1887 to 1891, he was a lecturer in Chemistry, under the late Dr. C. P. Girdwood. He attained his professorship in 1891, succeeding Dr. Girdwood, in 1902, as professor of organic and biological chemistry. In 1912, he became director of Chemistry for the University. Since that time, he has consolidated the teaching of this subject at the University and developed all branches of the subject.

His contributions to the literature have been regular and important, particularly in organic and biological work. In 1895, he became a Fellow of the Royal Society of Canada, and has been President, first of the Science Section, and, in 1920, of the whole Society. He became Chairman of the Canadian Section of the Society of Chemical Industry in 1912, and a Vice-President of the Society in 1914.

Dr. R. F. Ruttan.

As a side light on the man himself it may be said that he has always been much interested in athletics. He was a successful long distance runner in his undergraduate days and a leading cricket player. He was a member of the Canadian Olympic Committee in 1908. Now he may be found regularly on the golf courses of Montreal clubs.

He was appointed to represent Canada at the International Research Council, held in Brussels, in July, 1919; and acted on the Committee in charge of drafting the regulations governing the International Union of Pure and Applied Chemistry.

His greatest public work has been accomplished through his connection with the Dominion Government in matters relating to Industrial Research. First, as head of the Committee on Chemistry and then as Chairman of the Advisory Council for Scientific and Industrial Research, he has devoted a vast amount of effort and time in the matter of securing a Research Institute for Canada. This work, originating during the war, has brought him in touch with all our industries and the men who run them. National progress has been slow in this direction; but the educational work being carried on by the Council, with the Government on the one hand, and with industrial people on the other, is showing some results and when a national policy of research and co-operative public development of our resources is established, in a big way, a great deal of credit should go to Dr. Ruttan for his work and guidance.

His personality is decidedly magnetic and commanding. He will easily fill the "Chair" as president of the Society, and personally, we believe nature had a hand in his selection. He seems made for presidential appearances. We have now seen him in several chairs, as one honor has succeeded another, and he has filled them adequately in every way; so that it is in good order to say that in his new work he has our confidence, congratulations and best wishes.

That the work that Dr. Ruttan has done for Canadian chemists is appreciated by them, goes without saying. Their interests have ever been his, and what he has accomplished should prove most inspiring to every chemist, especially those entering their professional careers. It will be their hope that Dr. Ruttan will be spared for even greater things for the future.

Establishing the Society of Chemical Industry in Canada

Some Notes on the Founding of the Canadian Section in 1901

THE occasion of the holding of the Annual Meeting of this Society for the first time in Canada this year, is an event of the greatest importance in the history of Canadian chemistry. We have endeavored to gather some information regarding the growth and development of the Society from its earliest beginning in this Dominion to its present organization of five distinct sections.

Previous to 1901 there were not more than five or six members of the Society in Canada, and it would appear that among the most active of these few was Dr. Harold van der Linde, now President of the van der Linde Rubber Company, Toronto.

The missionary work in the interests of the Society, necessary to the first organization meeting, was carried on and initiated for the most part by Dr. van der Linde, according to the memories of the chemists best qualified to judge. For that reason, the Society owes him a considerable debt of gratitude for his early and continued work on its behalf. For some time previous to this date Dr. van der Linde has been one of the two or three members of the Society in Toronto, and as industrial chemistry was more or less unknown to Canadian manufacturers, his task was not a small one. After consulting with the late Dr. Hodgson Ellis at the University, and following a visit to England and consultation with Mr. Cresswell, then Secretary of the Society in London, he constituted himself a committee of one to see what could be done. It was rather beyond the conception of the officers of the Society in England at that time that a Canadian Branch could be established with success, and it was only after a considerable amount of personal work among local manufacturers, that the movement started. A lack of appreciation and various degrees of ignorance restrained many from enthusiastic support.

MR. ALFRED BURTON
Honorary Secretary of Canadian Section from its inception in 1901 Until 1920, when Separate Sections Were Formed.

DR. W. L. GOODWIN
Past Chairman of Canadian Section.

Considerable credit for the successful organization of the Society in the first instance is due Mr. P. W. Ellis of Toronto, who at that time was President of the Canadian Manufacturers' Association. He conceived at once the valuable aims and objects of the Society and placed the organization he represented squarely behind the movement.

It was arranged that those whose support had been promised, and others, should attend a dinner of this Association at which the then newly appointed head of the Department of Chemistry at the University of Toronto, none less than Col. W. R. Lang, should give an address on "Science in Industry." This in itself was an unprecedented breaking of new ground on the part of the Manufacturers' Association. Thus a start had been made and organization followed fairly rapidly.

In the beginning the Society had a much closer connection with manufacturers than it appears to have at present. The first meeting held to organize a Canadian Branch of the Society, was held in the office of the Canadian Manufacturers' Association, Board of Trade Building, Toronto, October 23rd, 1901, at 8 p.m.

From the minutes of this meeting, the originals of which are in the hands of Mr. W. A. Burton, the following extracts have been made and we incorporate them here for their genuine historical value:—

Mr. P. W. Ellis, President of the Canadian Manufacturers' Association, occupied the chair.

Others present were Messrs. Louis Huffman, James M. Neil, L. R. Vorce, R. R. Barber, J. M. Sparrow, Geo. J. Webster, Ed. Hawes, Thos. Heys, Frank B. Kenrick, F. B. Allan, Wm. T. Addison, Fred Yehle, W. Lash Miller, G. J. Kelly, A. MacDowell, W. G. Rook, John J. Moriarty, J. J. Moriarty, W. T. Stuart, F. J. Smale, Beattie Nesbitt, E. G. R. Ardagh, W. H. Van Winckle, D. G. Buchanan, J. Watson Bain, G. R. Mickle, J. P. Murray, Alfred Burton, W. E. Fisher, Dr. G. M. Campbell Arnott, Chas. M. Chase, W. L. Goodwin, Harold van der Linde, John W. Anthony, R. W. Sidall.

Mr. T. A. Russell, Secretary of the Manufacturers' Association, acted as Secretary for the evening.

The Chairman asked all present to register their names and then proceeded to explain the objects of the meeting, and the purposes, as he understood them, of the Society of Chemical Industry.

Then followed a discussion by Prof. Goodwin, of Queens University, Kingston, and Dr. G. M. Campbell Arnott.

J. P. Murray moved, seconded by Mr. Alfred Burton, that this meeting do now express its desire to form a Canadian Branch of the Society of Chemical Industry and that the necessary steps be at once taken to bring this about.

This motion was supported in discussion by Mr. F. J. Smale, Dr. Beattie Nesbitt, Prof. Lash Miller, Prof. Stuart, Thos. Heys and Mr. Barber.

The motion carried unanimously.

The Chairman then called for those present who were members of the Society, to which Messrs. M. van der Linde, G. E. Arnott, Prof. Goodwin, and J. M. Neil responded.

The following gave their names as willing to become members at the beginning of the year 1902:—

Dr. Beattie Nesbitt, J. P. Murray, of the Toronto Carpet Co.; Alfred Burton, of the Merchants Dyeing and Finishing Co.; Dr. Stuart, Trinity University; Geo. J. Webster, of the Standard Chemical Co.; F. J. Smale, of the Wm. Davies Co.; Louis Huffman, of the Morton Co., Ltd.; R. R. Barber, of Wm. Barber & Bros., Georgetown; J. M. Sparrow, of the Imperial Varnish and Color Co.; E. G. R. Ardagh, of the School of Practical Science; W. Lash Miller, of the University of Toronto; P. W. Ellis, of P. W. Ellis & Co.; Thos. Heys, of the Thos. Heys Sons Co.; L. R. Vorce of the Ontario Chemical Works; W. L. Addison, of the Wm. Davies Co.; J. Watson Bain, School of Practical Science; F. B. Kenrick, of the University; F. B. Allan; ;H. H. Millar, Consumers Gas Co.; J. J. Moriarty, Gutta Percha & Rubber Co.; John Cowan of the Cowan Co., Ltd.; J. W. Flavelle, of the Wm. Davies Co., Ltd., by F. J. Smale.

Moved by Mr. van der Linde, seconded by Mr. J. P. Murray, that the Branch have regular meetings, the actual dates to be decided later by the Executive Committee.

Nominations for a committee to arrange a programme were proceeded with, resulting in the unanimous selection of the following:—

Mr. van der Linde, convener, and Alfred Burton, F. J. Smale, J. M. Sparrow, G. M. C. Arnott, Prof. Lang and Prof. Ellis.

Resolved that the next meeting of the Executive be held Thursday evening, Oct. 31st, in the Manufacturers' rooms.

Moved by Dr. Beattie Nesbitt, seconded by Dr. Stuart, that a vote of thanks be tendered to the Canadian Manufacturers' Association for their interest and assistance in the formation of this section, and for the use of their offices for meetings. Carried unanimously.

Moved by Mr. F. J. Smale, seconded by Mr. Ardagh, that the meeting place on record its deep appreciation of the work done by Mr. van der Linde in the formation of the Canadian Branch. Carried.

The meeting then adjourned.

Thus was the Canadian Section established in Toronto. Within a few years it became strong enough to expand its activities and undertook to establish, in 1907, a branch in Montreal. Here at first no great enthusiasm was shown but when Dr. Milton Hersey and a few others undertook active work in the interests of the cause, it was not long before the necessary members were gathered and a most successful branch established. For a long period meetings were held in Montreal and Toronto only, with one or two exceptions. About 1917, due no doubt to the increased activities of chemists in war work and their increasing number, successful efforts were made to establish a branch in Ottawa and a new section in Vancouver known as the Canadian Pacific Section. The leaders in this matter in

PROF. J. W. BAIN,
President, Canadian Institute of Chemistry.

Ottawa were Mr. A. Burton, Mr. J. Race, Dr. F. Shutt and Dr. A. McGill. The establishing of the Society on the Pacific Coast is due in a large way to the work of Mr. J. A. M. Dawson of Vancouver.

The rapid growth of chemical industries at Shawinigan Falls during the war made a section possible for the district and following a real campaign for members and some enthusiastic assistance from the Montreal Section a beginning was made there some two years ago.

During this long period up to 1920 Mr. A. Burton had been the chief organizer and Hon. Secretary of the Society in Canada. As the work grew it became evident that the overhead council with one Canadian Section consisting of several branches, was not suitable to conditions here, and as a result each branch became a section with direct connections with the Council in England.

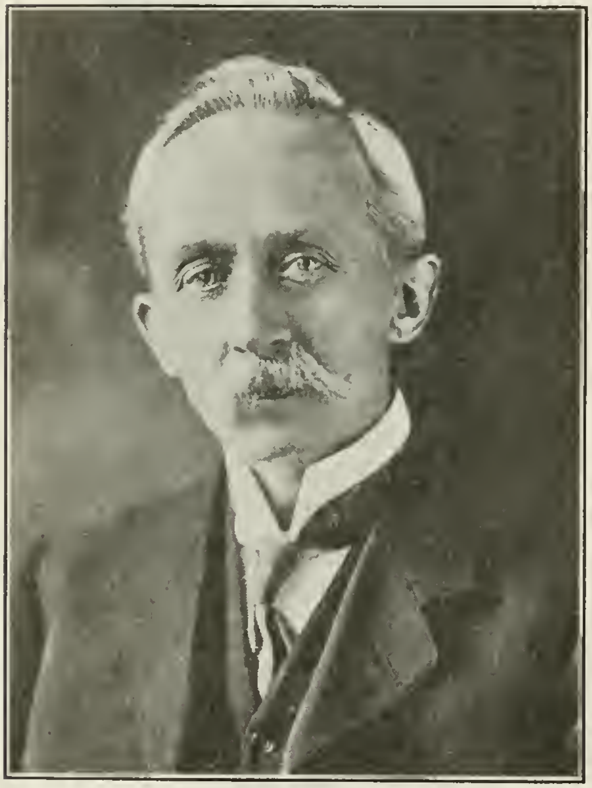
For a number of years the Canadian Section published an annual review of meetings held and a list of members. Many prominent chemists have addressed the various branches and students from our universities have been introduced to commercial affairs through the Society. The Society has always supported legislation designed to further research and the development of trade, and should continue to make further progress now that its sections cover the chief industrial districts. If it continues to educate and interest manufacturers in a knowledge and an appreciation of the principles of chemistry as applied to industry, it will be fulfilling the ambitions of its founders. Even in this short period the greatest advances have been made and as the chemist of today should become the execu-

tive of tomorrow, the Society should continue to accumulate its power and expand its usefulness.

Past Chairmen of the Canadian Section are:—

Col. W. R. Lang	1902-1904
*F. J. Smale	1904-1906
*Prof. W. H. Ellis	1906-1908
Milton L. Hersey	1908-1910
Prof. W. Lash Miller	1910-1911
A. McGill	1911-1912
W. P. Cohoe	1912-1913
Prof. R. F. Ruttan	1913-1914
Prof. J. Watson Bain	1914-1916
T. H. Wardleworth	1916-1918
Prof. W. L. Goodwin	1918-1920
Harold van der Linde	1920-1921

*Deceased.



MR. THEO. H. WARDLEWORTH.

Mr. Wardleworth is a past chairman of the Canadian Section and a member of the General Council, and he has had a great deal to do with the bringing of the Convention to Montreal. He is a director of the National Drug and Chemical Company, Limited, Montreal and Toronto.

THE AUSTRALIAN STEEL INDUSTRY.

Though the Australian iron and steel industry, like that of other countries, is depressed, plans have been completed for the establishment of a new steel works at Port Kembla, in southern New South Wales, involving an outlay of about £2,000,000. The enterprise is being undertaken by Messrs. C. & G. Hoskins, Limited, owners of the Lithgow Steel Works. The intention is to instal the most modern equipment capable of producing a large variety of iron and steel sections, and the decision of Hosktns, Limited, to transfer from Lithgow to Port Kembla has been influenced largely by increased railway freights.

A STEEL PLANT FOR BRAZIL.

The Brazilian Minister of Agriculture, Industry and Commerce has entered into a contract with a firm of engineers at Rio de Janeiro for the erection of a large steel manufacturing plant equipped with electric furnaces. Hitherto the greatest obstacle attending the development of the Brazilian iron deposits, one of the largest of which is located in the Itabira do Matto Dentro district, and is estimated to contain 132,000,000 tons of ore, has been the lack of fuel. The contract referred to calls for the use of water-power for the smelting of iron ore by hydro-electric energy.

Finnish pig iron, which was sold last autumn in considerable quantities to Sweden and Denmark, is now finding buyers in Germany for best qualities.

DR. W. H. NICHOLS.

Dr. Nichols is an Englishman by birth and first came into prominence in Canada as head ot the Nichols Chemical Company. The first plant for the manufacture of sulphuric acid from pyrites was erected at Capelton, Quebec, by him, and was shortly followed by others at Sulphide, Ont., and Barnet, B.C.

In 1899 he was instrumental in the formation of the General Chemical Company of the United States, which was united in 1920 to the Solvay Process Co., The Semet Solvay Co., The Barret Co. and the National Aniline and Chemical Co. under the name of The Allied Chemical and Dye Corporation with Dr. Nichols as chairman, forming the largest chemical organization in existence.

Dr. Nichols is past president of both The Society of Chemical Industry and the American Chemical Society, and was president of the last International Congress of Applied Chemistry. In 1920 the Italian Government conferred upon him the rank of Knight Commander of the Crown of Italy.

Chemical Society News

Convention of Anglo-Saxon Chemists, Montreal

FINAL arrangements have been made for the Annual Meeting of the Society of Chemical Industry to be held in Montreal during the week of August 29th. On this, the first occasion on which the Annual Meeting of the parent society of Great Britain has been held in Canada, many of the most eminent chemists of the world will be gathered together.

The overseas delegation will be headed by Sir William Pope, D.Sc., F.R.S., K.B.E., etc. Sir William Pope, President of the Society of Chemical Industry, was born in 1870 and after graduation was associated with the Manchester Gas Corporation as chief chemist for a number of years. From 1905 to 1908 he was professor of chemistry at Manchester University, since then he has been head of the department of chemistry at Cambridge. Sir William's work has been largely along the lines of Optical Activity and he is credited with the discovery of the relation between Crystal Form and Chemical Constitution. More recently he has been prominent in the public eye in connection with his most valuable work on the preparation of Mustard Gas. His researches on this product enabled the British Government to enormously increase production of this weapon in the late war. In 1919 Sir William was created Knight of the British Empire.

Other prominent figures of the party include Dr. Louis A. Jordan, Chevalier of the Crown of Italy, F.I.C., A.R.C. Sc., etc., whose work as a member of the British Mission on explosives to the Italian government is well known; Dr. Andrew Smith, Managing Director of the firm of Leech, Neal and Co., Limited; Dr. C. J. Goodwin of the firm of Oscar Goodwin and Sons, Explosive Engineers.

Dr. Frederick William Atack whose principal work has been the Chemistry of Dyes, and to whom we are indebted for the excellent translation of Professor Wahl's "Manufacture of Organic Dye Stuffs," will also be present. Dr. Atack also organized the publication of the Chemists Year Book, which is now in its sixth edition.

The steel industry will be represented by Dr. Andrew McWilliams, C.B.E., A.R.S.M., whose experience in the management of steel works coupled with scientific researches have earned him a notable place among steel metallurgists.

Dr. C. S. Garland the pioneer manufacturer of thorium nitrate will also be a visitor.

Dr. Frederick William Gamble, director of Allen and Hanbury's Limited and professor J. W. McBain, are accompanying the party.

Among the notable visitors from the United States will be Dr. W. A. Noyes, professor of chemistry of the University of Illinois and past President of the American Chemical Society; Dr. Charles Herty, Editor of Industrial and Engineering Chemistry; Dr. W. H. Nichols, president of the Allied Chemical and Dye Corporation.

There will be a general gathering of chemists from every portion of the Dominion of Canada.

The principal feature of the opening session will be the address of the retiring president, Sir William Pope, which will be followed by the introduction of the President elect, Dr. R. F. Ruttan.

The succeeding two days will be confined to technical papers and discussion at both the morning and afternoon sessions.

The annual banquet of the Society will be held at the Windsor Hotel on the evening of Tuesday, August 30th. Speeches will be given by leaders in Government, Scientific and Commercial circles.

The Montreal programme will conclude with a special convocation at McGill University, followed by a garden party which will be given by the ladies of Montreal.

On leaving Montreal the visitors will be the guests of the Shawinigan Section of the Society, where every facility will be afforded them for the inspection of the many interesting industries which have grouped themselves around Shawinigan Power development.

From Shawinigan Falls the party will proceed to Ottawa, thus giving the Ottawa chemists opportunity of adding their welcome.

Leaving Ottawa Friday night, the guests will arrive at Toronto the following morning where the itinerary will include a visit to the Canadian National Exhibition. An opportunity for rest will be afforded during Sunday at Niagara, followed by inspection of plants around the Falls. At noon on Monday the party will cross the International Bridge and become the guests of the American Chemical Society, who have arranged a most excellent programme including visits to Buffalo, Syracuse, New York. via the night line down the Hudson River. At New York opportunity will be afforded them of meeting the members of the New York Section of the Society of Chemical Industry. The guests will then be privileged to attend the annual meeting of the American Chemical Society, the banquet of which will be held on Friday evening. The following two days will be devoted to sight seeing and such rest as may be thought desirable to enable the visitors to enjoy the National Exposition of Chemical Industries which opens on the week of September 12th. This Exposition is unique and forms a fitting climax to the tour.

PROGRAMME OF THE ANNUAL MEETING OF THE SOCIETY OF CHEMICAL INDUSTRY AT MONTREAL, AUG. 29 TO 31, 1921.

Monday, August 29th—Morning.

9-10.00 a.m.—Registration.
10.00 a.m.—Council Meeting at McGill University.
11.00 a.m.—Annual Meeting.
(a) Address of Welcome.
(b) Reply.
(c) General Business of the Society.
Annual Address—Sir William Pope.

Afternoon.

1.00 p.m.—Lunch at Ritz Hotel, given by Montreal Section.
3 p.m.—Special visit to McDonald College; tea and garden party.

Evening..

Private Dinners.

Tuesday, August 30th—Morning.

10-10.30—(a) Address—Dr. Lash Miller.
(b) Paper on "The Problems Encountered in the Development of the High Speed Paper Machines at the Laurentide Co. and Their Solution," Mr. Geo. D. Kelherry.

(c) "Waste Sulphite Liquor and Its Commercial Utilization," R. Hovey.

(d) Moving Picture of the Manufacture of Paper and Wood Operations at Price Bros.' Paper Mill.

Afternoon.

1.00 p.m.—Luncheon at the Windsor, given by the Montreal Section.

3.00 p.m.—Paper, "Manufacture of Hydrogen Peroxide," Dr. Otto Maass.

Peat, Dr. E. P. Moore.

Lignite Briquetting, Mr. Leslie R. Thompson.

Evening.

7.30 p.m.—Banquet at Windsor Hotel—Speeches.

Wednesday, August 31st—Morning.

10.00 a.m.—Papers:

"Heat Intercepting Glasses," by Dr. Gelert Allerman.

"The Manufacture of C. P. Chemicals at the Eastman Kodak Co.," by Dr. C. E. K. Mees.

"Rubber Resins," Dr. G. S. Whitby.

Afternoon.

1.00 p.m.—Luncheon at Windsor Hotel, given by Montreal Section.

3.00 p.m.—Special Convocation at McGill and Garden Party.

Evening.

7.00 p.m.—Private Dinners.

11.55 p.m.—Leaving for Shawinigan Falls.

Details of the trips through Ottawa, Toronto and the Canadian side at Niagara call for a visit to the plant of the British-America Nickel Corporation at Deschenes and possibly the Dominion Experimental Farm, as well as the principal Government Buildings. At Toronto the party will come in at North Toronto Station, according to present plans and will be taken to the residences of the University. During the morning an inspection trip of the harbor will be made, followed by a luncheon at the Exhibition. The principal speakers of the day at the Directors' Luncheon will be selected from the party, and the afternoon will be spent in visiting the exhibits and motoring around the city and lake shore. In the evening reservations will be made for those who desire to see the night performance before the Grand Stand. Sunday morning the party will move by boat to Niagara, taking the Gorge Route to the Clifton Hotel. On Monday the Hydro developments will be inspected and a joint luncheon given in the park, when the party will be turned over to the official guidance of American friends.

AMERICAN CHEMISTS TO RECEIVE VISITORS AT NIAGARA FALLS.

It is announced that Governor Miller of the State of New York will be present on Labor Day to welcome officially the distinguished members of the Society of Chemical Industry entering the United States at Niagara Falls.

After having had their luncheon on the Canadian side of the Falls, the party will be taken in automobiles to the American side, where they will be met by Governor Miller and a reception committee. This committee will be: Mr. S. R. Church, chairman of the American Section of the Society of Chemical Industry; Professor Edgar F. Smith, President of the American Chemical Society; Dr. David Wesson, President of the American Institute of Chemical Engineers; Dr. Acheson Smith, President of the Electro-Chemical Society, and Professors Charles F. Chandler, Ira Remsen and M. T. Bogert, and Dr. William H. Nichols, all past-presidents of the Society of Chemical Industry.

Following the reception at Niagara Falls, the party will be taken through some of the power plants and then proceed to Buffalo. They will then go to Syracuse in a special train, after dinner at Buffalo, where they will be entertained at luncheon and inspect the Solvay process factories there. They will then go on to Albany, from which point they will embark on the night boat on the Hudson River for New York City.

Their arrival there will be signalized by a series of receptions and entertainments, and by joint sessions and social functions with the American Chemical Society, which holds its fall meeting from September 6th to 10th, inclusive.

It is estimated that there will be between three and four thousand participating in this notable gathering of Anglo-Saxon chemists. The total membership of the American Chemical Society is 15,500, of which 2,500 are in the New York section alone. The local section of the Society of Chemical Industry has several hundred members.

According to the preliminary programme of the American Chemical Society, made public, registration begins at the Chemists' Club, 52 East 41st Street, on Tuesday, September 6th. The dinner of the Council will also be held on the following day (Wednesday, September 7th) at Columbia University, and at half-past twelve o'clock the Society of Chemical Industry's luncheon to British and Canadian visitors will take place. There will be a reception and lawn party for the members of all societies concerned, to be held on the campus of Columbia University, and in the evening comity will be drawn the closer at a smoker in the Waldorf-Astoria. A joint meeting of the American Chemical Society and of the Society of Chemical Industry of Great Britain has been arranged for four o'clock on Thursday afternoon (September 8th) and in the evening a banquet will be held at the Waldorf-Astoria. The various divisional and sectional meetings are scheduled at Columbia University.

The sessions will conclude with a public meeting, at which the president, Dr. Smith, will deliver his annual address. The last day will be given to excursions to various chemical plants and other points of interest in the city.

NOTICE OF ANNUAL MEETING OF CANADIAN INSTITUTE OF CHEMISTRY.

Notice is hereby given that the Annual Meeting will be held in Montreal on Monday, August 29th, at Windsor Hotel, at 1.30 p.m. The annual dinner will be held at 7 p.m. and a second meeting at 8.30 the same evening.

The following agenda will form the basis of the meeting: (1). Registration. (2). Reports of officers. (3). Adoption of bylaws and charter as approved by the Secretary of States. (4). President's address. (5). Discussion of legislation and the question of securing provincial legislation for chemists aiming to obtain a legal status similar to that of other professions. (6). The question of the relation of the Institute to the general scale of remuneration for chemists. (7). Discussion re amalgamation with Manitoba Chemical Society and Maritime Chemists' Association. (8). Letters of good will to other chemical organizations. (9).

Election of Sir William Pope as an Honorary Fellow. At the evening meeting there will be an address by Dr. Baril (just returned from Brussels), on the work of the International Chemical Union, followed by moving pictures of the Frasch Process for Sulphur.

Members of the Council of the Institute will meet at 393 Guy Street, 9.30 a.m., Monday, 29th inst., and again at 5 p.m., Wednesday, August 31st.

AMERICAN CHEMICAL SOCIETY EXPECT LARGE MEETING.

The fall, 1921, meeting of the American Chemical Society will be held with the New York section, September 6th—10th. This is expected to be the largest meeting of the Society ever held, for, in addition to the 2,500 members of the New York section, the Society will have as their guests the visiting members of the Society of Chemical Industry, from Great Britain and Canada. A further reason for this being a large meeting is the opening of the National Exposition of Chemical Industries, on September 12th.

ANNUAL MEETING OF MARITIME CHEMISTS' ASSOCIATION.

The annual meeting of the Association will be held on Friday, August 5, 1921, at Truro, N.S. Dr. H. E. Bigelow, president and acting secretary, announces that an excellent programme has been arranged. Details of the meeting will appear in a later issue.

THE INSTITUTE OF CHEMISTRY ADDS QUEEN'S TO THE LIST.

The Institute of Chemistry has recently added the names of some half dozen universities throughout the Empire which in future will be recognized as qualified to train candidates for examinations. Queen's University, Kingston, is included. This will make three such recognized universities in Canada—Toronto, Queen's and McGill.

FRENCH METALLURGICAL INDUSTRIES.

During the past two years a big change has taken place in the position of the metallurgical industries of France, and French iron founders are facing intense competition from Belgian and German firms, imports amounting to 1,026,409 tons last year, as compared with 202,753 tons in 1913. France produces to-day about 250,000,000 tons annually in the various French and German mines under her control, as compared with the 60,000,000 tons which were consumed in France in pre-war days, but the big founders pay 90 francs a ton for coal and 110 francs per ton for coke, as compared with the approximate equivalent of 47 francs and 65 francs respectively for coal and coke in Germany. The most unfortunate industries under these conditions are the siderurgical furnaces, established in the centre of France under pressure of war necessities, which find themselves facing economic industrial facts, with their plants far away from the coalfields of Western France and equally distant from those of the Nord and of Alsace and the Saar. The projected development of hydro-electric power on an enormous scale along the banks of the River Rhine may in time bring a measure of relief to the particular circumstances affecting these plants, but for this solution they will have to wait for from six to fifteen years during which the vast works connected with this mammoth scheme are in progress.

AMERICAN CERAMIC SOCIETY MEETING AT ST. LOUIS IN 1922.

The Twenty-fourth Annual Meeting of the American Ceramic Society will be held in St. Louis, February 27 to March 2, 1922.

St. Louis is growing to greater importance as an industrial city every year. It is one of the largest centres for refractories and heavy clay products, while enameled ware, glass, and terra cotta are abundantly represented. A week of trips for the inspection of plants would be none too long.

The Hotel Statler will be the headquarters of the Society and its facilities for the comfort of the meetings are unexcelled. Large rooms for divisional meetings, with a choice of ball-rooms and banquet-halls for the general sessions, will be available; while the luxury of the private rooms is too well-known to need description.

MR. F. W. GAMBLE.

Mr. Frederick William Gamble is a Director of Allen & Hanburys, Ltd., London. He is a native of Norfolk, England, and was born in 1872. He came to London in 1887 as an apprentice in pharmacy, studied under Dr. John Muter, and qualified as a Pharmaceutical Chemist in 1894, being a prizeman both at his college and in the Pharmaceutical Society's Examination of that year. Mr. Gamble joined the firm of Allen & Hanburys, Ltd., at Plough Court, becoming a Director of the Company in 1913. Mr. Gamble is visiting, during his Canadian trip, the newly established works of the Allen & Hanburys Company in Lindsay, Ontario, where the "Allenburys" foods and other preparations are manufactured for sale on this continent.

A new technical school will be erected in the Riverdale District, Toronto, at a cost of $800,000, the Dominion Government bearing one-half the cost.

BOOK REVIEWS

"THE MANUFACTURE OF PULP AND PAPER."

Volume I and II. (McGraw-Hill Book Company, Inc., New York.)

These are the first two of a set of five volumes of a reference and educational work prepared under the direction of a Joint Executive Committee, representing the pulp and paper industry in the United States and Canada. The work was undertaken nearly three years ago at a conference of the Educational Committees of the industry in the two countries. It was the feeling of all concerned that the text-books available for instruction of mill-workers in evening classes or for home study were lacking in many essentials.

The industry in both countries agreed to supply the necessary funds, and the work was begun, with J. N. Stephenson, editor of the Pulp and Paper Magazine of Canada as editor-in-chief.

The present two volumes constitute the elementary work preparatory to and integrated with the remaining three volumes to be issued as they come off the press. This elementary work has been especially written with a view to its application to the pulp and paper industry. Volume I covers Arithmetic (128 pages), Elementary Applied Mathematics (146 pages), How to Read Drawings (35 pages), and Elements of Physics (120 pages), written by J. J. Clark, formerly of the International Correspondence Schools, who is acting as assistant editor, to put material into shape for correspondence instruction. Volume II covers Mechanics and Hydraulics (208 pages), Electricity (159 pages), written by Mr. Clark, and Chemistry (166 pages), written by Mr. T. Linsey Crossley, chairman of the Committee on Education of the Canadian Pulp and Paper Association.

The arrangement followed for reference is that of numbered sections, parts and paragraphs, with examination questions and answers. The subject matter gives every indication of great care in preparation. The diagrams are well drawn and clean. The indexing system refers to both section and page: each section being paged individually with a view to revisions and additions. The pulp and paper industry is to be congratulated on its enterprise in putting this work through. It is for sale in Canada through the Canadian Pulp and Paper Association, Drummond Building, Montreal, which is now ready to receive subscriptions for the five volumes at five dollars ($5.00) per volume, as published.

"ANIMAL PROTEINS."

By H. G. Bennett, Balliere, Tindall & Cox, Ltd., London; Westman Press, Ltd., Toronto; 287 pp.; price, $3.75.

This book is decidedly for the leather, glue and kindred trades. Colloid Chemistry has in the past few years given them and their problems a definite position among chemical industries.

Part One deals with hides for heavy leathers, raw materials, their preparation, tanning and manufacture into sole, belting, harness, upper and bag leathers.

Part Two covers light leathers, goatskins, sealskins, sheepskins, calfskins, Japanned and enamelled leathers.

Part Three—Chrome Leathers—General methods of manufacture and some consideration of special problems. Following this is a general chapter on miscellaneous tannages, including Alum, Fat, Oil, Formaldehyde, Synthetic and Combination Treatments.

Gelatine and Glue are treated in a separate section and the work is closed with some considerations of by-products of these industries.

The author is already known in this field from previous books and papers and this latest work, bringing manufacturing practice to date, will be welcomed by leather and glue makers.

The name does not quite indicate the practical nature of the work nor the fact that in some places chemistry is presented in good, solid, mathematical forms. We know of no better presentation of the same subject matter.

"TABLES OF REFRACTIVE INDICES."

Volume 2, "Oils, Fats and Waxes." By R. Kanthagk. 295 pp. Adam Hilger, Ltd., London. £1 5s.

This second volume of the series of tabulated refractive indices is now available. Volume 1, published in 1918, dealt with Essential Oils and Volume 3 will cover solutions.

Some 2,500 measurements on 500 different oils, fats and waxes are tabulated from original literature. The limits observed in common oils are given, and at least one value for those met with less often. In this work it has become obvious that there is need for a critically accurate determination of temperature coefficients, so that all data may be reduced to one or two standard temperatures.

A very complete Bibliography of original articles is given, and data given may be thus traced directly to the original source. Ample space is left in the book for notes and observations on the part of the user. It is indeed a very practical book for the chemist, and the completed series may hope to become a standard reference.

NEW CHEMICAL INDUSTRIES IN JAPAN INTRODUCED DURING AND SINCE THE WAR.

Japan during the war manufactured a large number of goods never before made in the country. The difficulty in importing certain articles and the prospects of capturing markets once these goods were manufactured in Japan gave a great fillip to enterprise. Among the principal goods that were manufactured for the first time in Japan during the war as a direct consequence of the difficulty of importing them were the following:

Chemical Products: Coal-tar dyes, artificial perfumes, artificial black lead, electrolytic soda, potassium, bromide, potassium bichromate, hard oil, metallic magnesium and glycerine.

Ceramic Products: Thick plate glass spun glass, watch glass, optical glass, artificial diamonds, dry plates, sanitary chinawares, scientific chinawares, German tiles and porcelain dolls.

Metals: High-speed steel, tinplates and zinc sheets.

DISCOVERY OF PHOSPHATES IN JAPAN.

According to the "Japan Times," a deposit of phosphates has been made on a hitherto unknown island lying to the south of Rasa Island, which is superficially estimated to contain 15,000,000 tons. Development work has already begun, and the company is negotiating with the banks for $3,500,000 with which to finance operations.

NOTES ON THE INDUSTRIAL AND GENERAL SITUATION IN SOME CANADIAN BASIC CHEMICAL AND METALLURGICAL INDUSTRIES.

Asbestos.

The most important deposits of asbestos in Canada are situated in the Serpentine belt crossing the Eastern Townships of Quebec. From the mines of the Danville, Black Lake, Thetford and East Broughton districts, about 90 per cent. of the world's supply is taken, the balance coming mainly from South Africa.

Of the crude asbestos, the first handpicking is composed of fibres ¾" and over. The second picking and ¾" includes all that can be separated by hand. Defibreized asbestos is generally classified as follows: (1) Fibre and shingle stock —consisting of longest fibres, fit for lining, but rarely used for weaving; (2) paper stock—containing short fibres used in making paper, felts, articles; (3) Asbestic—a crushed serpentine rock used for plaster, cement, fire-proof brick.

The density is 2.5, and fibres may run to three inches. Single threads sometimes run to 5 or 6 inches. A typical analysis of Thetford Asbestos shows: Silica, 39.05%; Magnesia, 40.07%; Iron Oxide, 0.87%; Alumina, 3.67%; Water, 14.48%. Production since 1919 has fallen off, but not seriously, considering the strong financial condition of companies. One company is prepared to manufacture asbestos products in Canada, at Asbestos, Que.

Barytes.

Canada is importing barium products in a large way, and there are several occurrences of more or less promise in British Columbia, Manitoba and Ontario. Capital has not considered the industry very seriously, the most persistent effort being that of the Langmuir Mines, Ltd., near Porcupine, Ont. A deposit at Lake Ainslie, Nova Scotia, has also shipped some ore. Barytes is a gangue mineral, associated with some Western ores, and it may pay to consider it as a by-product. The importance of barium chemicals would seem to warrant more attention, if a suitable source of barytes were obtainable and sufficient capital available to work in a large way.

Cement.

The cement business in Canada is, generally speaking, in the hands of large producers. The essential elements of Portland Cement are lime, silica and alumina, the last two as constituents of clay. Where limestone contains as much as 18 per cent. clay, cement rock is the result. This must be free from quartz and should contain not more than 5% magnesium carbonate, or 4% ferric iron, or 5% sulphur. From 2% to 3% of Nova Scotia gypsum makes a good agent to retard the setting. Trenton limestones have been found best for natural cement rock.

Lack of building operations have lessened the demand, while highway construction has tended to assist it. Special cement products are receiving more attention, and the Provincial Government for Ontario is considering going into the cement business for their own construction work. Every province is possessed of fair resources in raw materials.

Clays.

Fire clays do occur at several localities, but generally in undeveloped regions in Northern Alberta and Ontario, and in more settled districts in Southern Saskatchewan and Nova Scotia. Earthenware clays are being used in Southern Saskatchewan and brick and tile clays occur in all localities. The whole industry reflects the amount of construction work going on. In general, Western Canada will offer a very large field. Our chief imports are fire clays from the United States.

Coal.

The coal situation has been the subject of much recent discussion and investigation, because of high prices, adverse exchange, etc.

Canada has ample supplies of good bituminous coal, but not in Ontario and Quebec. Alberta and Nova Scotia are now about equal in their annual production. Eastern producers were handicapped by the loss of ocean shipping in the St. Lawrence, and are in the process of regaining the River market. Alberta producers are striving for the Manitoba market and an extension into the Western States, while British Columbia has the far Western markets to consider. The situation may always remain acute in the Great Lakes District, unless very cheap water transportation from Nova Scotia is obtained.

In the Anthracite field, there will be an increasing demand in Ontario and Quebec, and unless some new factors enter the situation, whereby bituminous coal and coke are used in private heating, the cost of imported anthracite will remain high.

Copper.

Practically all the pure copper produced in Canada comes from the electrolytic refining plant at Trail, B.C. The Granby Consolidated Mining Co., Ltd., and Canada Copper Corporation, Ltd., produce blister copper at their own smelters. Manitoba came into prominence as a possible copper producer within the last few years. With a better demand and price, and some transportation facilities, the Manitoba properties should produce in a large way. Some rich ore was taken out during the war. The International Nickel Company produces some copper in connection with their nickel refinery. Canada may easily become a very large producer of copper. Imports fell from over $4,000,000 in 1919 to $680,000 in 1920. Exports dropped in value from $8,500,000 to $5,250,000. This is only about one-quarter of 1918 production for export.

Fluorspar.

Canada has good quantities of fluorspar for metallurgical purposes. The Consolidated Mining and Smelting Co., of B. C., produce for export and their own use from the "Rock Candy" mine at Grand Forks, B.C.

Central Ontario could produce in considerable amounts, if a market was secured.

The uses of fluorspar, depending on the grade, are as a flux in smelting; in electrolytic refining of antimony and lead; and in the production of aluminum. It is used also in making glass, sanitary and enamelled ware, and is the source of hydro-fluoric acid.

Feldspar.

While Canada has unlimited sources of feldspar, production is confined to Southern Ontario, where 84,198 tons, worth $121,329, were exported in 1920. Imports were about one-fifth of this amount. No grinding mill is available for producing pottery grades, although the Ontario Government has considered assisting in the erection of such a mill.

Feldspar is a high temperature flux in producing white ware pottery from kaolin, ball clay and flint.

Gold.

1921 will be remembered as a real "boom" year in Canadian gold production. The larger mines are proving to be enormously rich, and the labor market is such as to allow profitable operation and development. Ontario is the leading producing province and the Porcupine-Timmins

district is expanding at a tremendous pace. Refined gold is produced, both at the Royal Mint, Ottawa, where large quantities are handled, and also at Trail, B.C.

Gypsum.

In this product also Canada is well supplied. Each province, as far west as Manitoba, produces quantities of raw and calcined gypsum. The Eastern provinces ship to the United States, while, in Central Canada, more is calcined. Eastern Canada gypsum is of the very highest quality, and is able to command the market in the Eastern States. The resources of British Columbia allow for full development. The business greatly increased during 1919, so that the industry went over the million-dollar mark for the first time. Whether it will maintain this for a few years is doubtful; but the future is very favorable.

Graphite.

In spite of considerable capital spent, the graphite business, with one exception, has not proven very enticing to date. Canada has resources which, if operated under joint management, might be able to develop and market products. The quality of Canadian graphite, flake or otherwise, is very fair; but some properties are not rich. The Calabogie, Ont., deposits have been the most successful to date. With a better and larger local market, Canadian graphite should develop; but it will be difficult to compete in foreign markets, unless the industry is enriched with capital and resources united.

Iron.

The Dominion Government is now publishing monthly reports on iron and steel production. Blast furnace plants are operated at Sydney, North Sydney, Deseronto, Ont., Hamilton, Port Colborne, Sault Ste. Marie, Midland and Port Arthur. Most of the iron ore is imported from Michigan and Newfoundland, and one of the problems before the Research Council of the Government is the utilization of Canadian ores by some suitable process. Canada is relatively rich in iron ores of a good grade, but the expense of mining, compared with American ore, has delayed developmeuts. Canadian producers, while in the same general situation as those in the United States, at the moment have had some increasing demand during the last few months; so that production would seem to have reached its lowest mark.

Magnesite.

The deposits of Quebec, along the Ottawa River, constitute Canada's chief resources. Canada's principal export market was the United States; but present conditions are not favorable for such development. The quality of magnesite available is very fair.

Mica.

This industry has long been established, but never seems to have gone beyond a certain stage. Producers operate in a very small way, and the Canadian product has been injured by a certain lack in uniformity of product. By centralizing production and classification for shipment a wider market might possibly be had. Most of the companies operating are located in Ottawa.

This article will be completed in September issue, when further items will be treated.

MANUFACTURING ASBESTOS PRODUCTS IN CANADA.

For a long time, Canada has exported from Quebec large quantities of raw asbestos. Large industries have been established, in the United States in particular, whose success depended on Canadian asbestos. The exporting of a raw product gave some labor and some return to Canada; but its manufacture into various articles gave more profit, and prosperity, elsewhere.

In line with the general warnings of public regard, there has been a larger effort made in more than one field to manufacture finished products in Canada from Canadian raw material, and asbestos interests are giving more consideration to the problem.

The first to fall in line and pioneer in large scale manufacturing here is the Canadian Johns-Manville Co., Ltd. They are building a plant at Asbestos, Quebec, to manufacture paper, asbestos roofing, asbestos shingles, packings, pipe coverings, textiles, etc. The raw asbestos leaving Canada last year amounted to $12,000,000, and it is no wonder indeed, that Canadian labor and the Government should begin to consider if a Canadian industry cannot be built on this most valuable raw material.

The new factory will supply Canada and British Empire markets and the net result should be that asbestos products should sell on the Canadian market at as low a price as exists. Some advantage should certainly accrue to the Canadian consumer. The mines of this Company, situated also at Asbestos, Quebec, employ 700 to 1,200 persons, and the Canadian Johns-Manville Co. is to be congratulated on its new policy of at least making a beginning at the creation of a real Canadian asbestos industry.

DOMINION STEEL HAS SATISFACTORY YEAR.

ALTHOUGH the actual volume of business transacted by the Dominion Steel Corporation during the year terminating June 30, 1921, was less than in the previous year, the President, R. M. Wolvin, in his address at the annual meeting of shareholders regards the year's record as satisfactory. The decreased business was largely due to the serious depression that prevailed in Great Britain, coupled with keen competition from European steel works. During the past year the Corporation had endeavored to keep operations at largest possible capacity, and disbursed in wages and salaries for the year the sum of $21,839,285.25. Referring to improvements in the various organizations making up the Dominion Steel Corporation, President Wolvin stated that the daily producing capacity of the Dominion Coal Company was now 15,000 tons, compared with a daily capacity of 10,500 tons a year ago. The daily coke producing capacity of the Dominion Iron and Steel Company has been increased from 1,300 tons of last year to 2,600 tons. The corporation now owns 68,000 tons deadweight of vessels for its various trades. The corporation has a large claim against Germany in respect of owned and time chartered vessels sunk by submarines, also against the British Government for losses suffered due to the requisitioning of steamships under time charter by the corporation. These claims are most difficult of adjustment. For the first quarter of the fiscal year ending June 30th, 1921, the corporation, after providing for depreciation, sinking funds, and bond interest, has earned at the rate of over three times the amount required for payment of the combined dividends on its preference shares, and on the preferred shares of its constituent companies. The wages paid the corporation's coal miners are larger than in any other coal field, and in the President's opinion were too high to permit of profitable operation of the steel plant under existing conditions.

The Belgian glass trade is extremely dull, and stocks are large, although most furnaces have been extinguished.

OVERSEAS AND FOREIGN INDUSTRIAL NEWS

Special Correspondence to Canadian Chemistry and Metallurgy. By Our London Representative.

To show how chemical trade slumped during the coal strike and over the period ending May 31st, imports for chemicals, drugs, dyes and colors were £842,352, compared with £1,062,842 for May, 1920, and £1,062,842 for May, 1913. Imports during the five months ending May 31 amounted to £6,778,202, as against £13,560,802 for May, 1920, and £5,816,476 for a similar period in 1913. During the same five months, exports were worth £10,037,118 in 1921, £15,661,170 for 1920, and £9,129,831 for 1913.

Imports of acetic acid for this period declined from £154,851 in 1920 to £21,211 in 1921. Calcium Carbide increased from £148,494 to £251,723. Nickel Oxide decreased from £160,781 to £942. Sulphuric acid plants were running at 25% capacity with enormous stocks on hand with the fertilizer market very low and the coke oven business shut down. At the present time a general turn for the better is taking place and big increases in trade are expected, so that statistics for the balance of the year should be much more encouraging.

The British Alizarine Company, of Silvertown, London, began operating new works at Trafford Park, Manchester, at end of June.

Nitrogen Fixation in Scotland.

The Nitrogen Products Committee of the United Kingdom advocates the establishment of a 60,000-ton cyanamid plant and a 10,000-ton synthetic ammonia plant in Scotland, based on hydro-electric power.

Expansion of Brunner, Mond & Company, Limited.

This company is developing their Winnington Works, near Northwich. The new alkali plant at this point, when completed, will be the most modern factory extant in this line. The company has an agreement with the British Government to manufacture synthetic nitrogen, using the patents of the Badische Anilin and Soda Fabrik and the information gained in England through war research in the same problem.

Fuel Alcohol Research.

Sir George Beilby, of the Fuel Research Board, recently stated that all the oil produced was equal to 7% of our fuel supply. He thinks that the development in oil shales will come very shortly and much sooner than any gigantic alcohol industry designed to revolutionize present practice. The alcohol question is being studied and its development will be hastened in every way.

Dyestuff Situation.

Negotiations which have been proceeding for some time past between the Chemical and Dyestuff Traders' Association of the United Kingdom and the Board of Trade in London respecting the refusal of the British Dyestuffs Corporation to supply its products to British merchants for export to foreign markets, where they have their own selling and distributing agencies, have resulted in a slight concession to merchants. In the final letter to the Board of Trade, the Association points out that "while the concession regarding the non-disclosure of the names of ultimate consumers is appreciated, it is not likely to prove of much actual value, as buyers here would find it impracticable to negotiate through an agency in, say, Shanghai, business in hand for an article manufactured in England and required for shipment from England."

Sir Robert Horne, British Chancellor of the Exchequer, replying to Sir W. Barton in the House of Commons recently, said the Government's holding in the British Dyestuffs Corporation, Limited, was 850,000 £1 deferred ordinary shares and 850,000 preferred shares, both fully paid. At current market quotations the value of these shares was £580,000, but in view of the depression in the textile industry he did not think the current quotation could be regarded as their proper value. He was informed that recent investigations indicated that while substantial progress had been made, the Board of the Company were not entirely satisfied with the position. The Government directors were in accord with their colleagues as to the necessity of securing efficiency, and steps were taken to that end.

French Government to Acquire the Alsatian Potash Mines.

The French Parliament has just empowered the State to acquire the Alsatian potash mines, an action that does not commend itself to the commercial community, which has unfortunate memories of the incompetence that has marked official management of the American war stocks, the mercantile marine, and other departments. There still remains, however, the fervent hope and the possibility that the Chamber will insist on a real business organization working the deposits in the national interest.

According to experts, the Alsation mines are more than satisfactorily placed from the point of view of competing with those of Germany, which, being of a completely different formation and composition, require difficult and costly treatment, whereas those of France need merely simple grinding before use for agricultural purposes. The Stassfurt salts, therefore, show a cost price considerably in excess of those of Alsace, though their average potash content is only 12 per cent., as against 18 per cent. for those of their rivals.

The importance to France of a rational and enterprising development of these new resources is evidenced by the fact that, practically speaking, it is these two basins that now supply the world, the deposits of Spain, Galicia, and the East not being yet properly exploited. America, for instance, consumed some 325,000 tons in 1914, when Germany used over half a million tons, France less than 40,000, and Great Britain 34,500.

Belgian Iron and Steel Industry.

Despite persistent efforts on the part of Belgian iron and steel producers to withstand any further fall in prices, lower quotations were made at the end of June. Several blast furnaces have been shut down during the past few weeks, and the output of pig iron has diminished notably. Keen competition is, however, being experienced from Germany and Luxemburg, and Germany is capturing all the large contracts on the market at lower rates than Belgian ironmasters are able to quote for merchant iron.

"From Swords to Ploughshares."

Some interesting facts regarding Germany's industrial activity are reported by Mr. P. Harvey Middleton, of the Guaranty Trust Company of New York, who has just returned from a tour of observation in that country. Krupp's works at Essen are engaged on a surprisingly wide range of production. Heavy locomotives are being turned out in the great locomotive shop at the rate of one a day; while another shop records a daily average of eight goods wagons. Five-ton lorries—every part of which, with the exception of the rubber tires, is made under one roof—are being con-

structed side by side with small motor scooters. Other manufactures include railway supplies of all kinds, machines for the textile and paper industries, dredges, floating docks, pneumatic tools, surgical instruments, Diesel engines, doors for safes, cash registers and adding machines, apparatus for moving pictures, etc. Passenger and freight steamers are being constructed at Krupp's Germania shipbuilding plant in Kielgaarden. The Rhein Metall Fabrik at Dusseldorf has also adjusted its operations from a war to a peace basis, and is one of the leading makers of railway rolling stock in Germany to-day. The present monthly output is 30 locomotives and 300 freight cars, while 1,000 locomotives and 1,000 goods wagons were constructed in less than a year. Both this works and Krupp's now employ more men than in 1914, and are executing a large volume of foreign orders.

German Reparation Payments in Respect of Exported Chemicals.

The Board of Trade in London has informed the Chemical and Dyestuff Traders' Association that they understand that German firms who inquire of their Government whether any guarantee has been given that the 26% deducted from invoice values by British importers under the German Reparation (Recovery) Act of the United Kingdom would be refunded to them from Berlin are receiving an affirmative reply.

The Breakdown of Russian Chemical Industries.

From details which are available in Paris concerning the condition of the Russian chemical industries last year it appears that the more important branches produced only 5 to 10 per cent. of their pre-war output. Certain materials, such as copper scrap, lead, zinc, etc., were of unsatisfactory quality. The following table affords a comparison between actual and estimated production. It should be noted that even if estimates had been realized only 50 to 60 per cent. of the most pressing local needs could have been covered:

	Output, 1920. Tons.	Percentage of estimate.
Sulphate of Copper	11,500	52.5
Acetic acid	14,200	68
Nitric acid	240	20
Caustic and calcined soda	10,000	108
Sulphate of natrium	10,000	73
Superphosphate	3,600	28.5

Of 14 dye factories listed, only five show evidence of any activity, and their output hardly reaches 5 per cent. of normal production.

Of seven indiarubber works four have been restarted by the Soviet authorities. Although their programme did not aim at more than 10 per cent. of normal production, the percentages of that programme actually attained were only: Shoes, 0 per cent.; belting, 85 per cent.; hose, 35 per cent.; tires, 31 per cent.; surgical goods, 30 per cent.; cloth, 45 per cent.

Makers of drugs, animal glues, and sizes also fell short of an extremely modest estimate by 50 to 70 per cent. Soap-boilers could obtain no supplies of animal fat, whilst the stocks of various seeds were sufficient to yield only 40,000 tons of oil. Since 33,000 tons are urgently required for technical purposes alone, practically none can be spared for general consumption.

The same remarks apply to paint and varnish manufacturies, as well as to ink and pencil making. Somewhat better conditions obtain in the match factories, which in 1920 turned out nearly one million cases, employing 10,485 men.

With regard to wood distillation, on the basis of returns for the first six months of 1920, it is hoped to attain in 1921 an output of tar equal to 90 per cent. of turpentine equal to 70 per cent., and of rosin equal to 100 per cent. of normal. Meanwhile rosin has vanished from the market.

Glass factories have suffered severely from lack of fuel, only 28 of the 146 controlled establishments having been in operation.

The Manitoba Mining Field

By R. C. WALLACE, COMMISSIONER OF NORTHERN MANITOBA.

THE mining areas in Manitoba provide an excellent field for investigation for those who look for new territory in which to make investments. It is yet only a few years since the northern areas of Manitoba were opened up by prospectors and mining men; and durthese few years Manitoba, without as yet increasing to any great extent her mineral output, has attracted wide attention as a coming copper mining territory of importance, and as a province where in several widely separated areas gold mining may reach considerable proportions. Had the copper market not been so seriously depressed early this year, conditions would have been ripe for obtaining much needed transportation to the Flin Flon district, and the right foundations would have been laid for a very important industry in copper. The Mining Corporation of Canada have now acquired control of this property, and will develop when copper prices return to normal. Even when copper is in the doldrums, new discoveries are being made in the copper belt, as an earnest that the district will not depend on one property for its prosperity. There will be many problems for the metallurgist in the treatment of the solid mixed chalcopyrite-sphalerite-pyrite ore which forms the bulk of the 16,000,000 tons of ore already proved up in the Flin Flon property, and which seems to be characteristic of the district generally. In the Lac du Bonnet country in Southeastern Manitoba, near Winnipeg, the chalcopyrite occurrences which have attracted much attention during the last year are similar to the Sudbury deposits both in the association of copper with nickel, and in the norite with which the mineral occurrences are associated.

Important Manitoba Gold Fields.

The day of the gold miner has come, and the industry which in war days was at a serious disadvantage, may now be expected to flourish. Two fields in Manitoba are important in this connection—the Rice Lake field 100 miles northeast of Winnipeg, and the Pas Mineral Belt, particularly the east end of that belt, at Herb Lake and adjoining territory. It is admittedly difficult to attract capital to new fields; but both fields merit careful investigation, and will repay such investigation. In the Herb Lake field, the Rex mine is the principal property, and has operated for more than two years. The main production of gold in the province has, to date, come as a minor constituent in the very rich chalcopyrite of Mandy mine, where, in a high grade lens of 26,000 tons, the copper values averaged 19 per cent of the total tonnage. With the encouragement of good transportation facilities,

the gold fields of Manitoba will doubtless prove an asset to the provinces such as those of Ontario are now proving to our sister province.

In the gypsum, cement and building stone industry, Manitoba supplies the markets of the middle west; while in brick and clay products the market is local. When the building industry re-establishes itself, it has enormous arrears to make up, and the gypsum, cement, building stone and brick plants will be taxed to the limits of their capacity to produce. There are prosperous years ahead for those engaged in the quarrying and manufacture of structural materials in Manitoba.

Dr. G. J. Fink, formerly with the Hooker Electrochemical Company, has been added to the technical staff of the chemical department of the National Lime Association, Washington, D.C.

OPERATIONS AT GOVERNMENT PEAT DEPOSIT.

Operations at the peat bog at Alfred, Ontario, where the Ontario Government has one plant in operation, and a larger one in course of construction, are progressing favorably. The plant in operation has a capacity of 60 tons per day, and the machine has been producing almost to its full capacity. Last year the sales of peat manufactured at Alfred amounted to nearly $20,000.

The Peat Committee which is carrying on the investigations at Alfred is composed of four members; two representing the Ontario Government, viz., Mr. A. A. Cole, of Cobalt, Ont., Chairman, and Mr. R. C. Harris, of Toronto, the other two, Mr. Robert A. Ross, of Montreal, who is also a member of the Lignite Utilization Board, and Mr. B. F. Haanel, of the Department of Mines, Ottawa, representing the Dominion Government.

DR. MILTON L. HERSEY, M.Sc., L.L.D.

Dr. Hersey is one of the founders of the Montreal Branch of the Canadian Section of the Society of Chemical Industry. He is president of the Milton L. Hersey Co., Ltd., Consulting Engineers and Chemists.

MR. H. W. MATHESON, M.Sc., F.C.I.C., CHAIRMAN MONTREAL SECTION S.C.I.

Mr. Matheson is a graduate of Dalhousie University, Vice-President of the Canadian Electro Products, Limited, and Vice-President of Shawinigan Laboratories, Limited. It was under his auspices that such satisfactory progress was made in the production of Acetic Acid and Acetone synthetically during the war, one of the most interesting chemical developments that Canada has seen.

REORGANIZATION OF SALTS AND POTASH CO.

According to notice of incorporation, a company known as Salts and Chemicals, Limited, has been organized to take over the business of the Salts & Potash Company of Canada, Ltd. This company had its offices and plant at Kitchener, Ont., and were interested in the recovery of sodium, magnesium and potash salts from Saskatchewan lake deposits. A refining plant has been operated in a small way at Kitchener for some time.

It is the intention of the new company to carry on the business in a larger way, developing the holdings of the company in Saskatchewan. The capital stock is rated at $2,500,000, and the head office of the new company will also be at Kitchener, Ont.

FRENCH ANILINE DYE INDUSTRY.

The development of the French aniline dye industry has made such progress during the past two years that the output capacity is now in excess of the consumption under the effects of the existing state of depression. In development of the dye industry in France, it is stated that the production of aniline dyes was started with an output of 175 tons, while the total production in 1920 amounted to 7,356 tons. This rate of production, however, is not being maintained at the present time owing to the industrial depression.

Mining and Metallurgy in British Columbia

(Special correspondence to "Canadian Chemistry and Metallurgy")

The Annual Report of the Minister of Mines for 1920 recently has been issued, and gives the value of the mineral output of the Province as $35,543,084, compared with $33,296,313 in 1919. The final figures do not vary greatly from those of the preliminary estimate, issued last January, although some of the individual items are vastly different. The zinc estimate, as your correspondent predicted at the time, was altogether too high, being 30,000,000 pounds in excess of the revised figures. On the other hand, the lead estimate was about 18,000,000 pounds too low and the copper 2,000,000 pounds. These two items, together with value of the non-metallic minerals, which was $1,000,000 too low, have brought the total value of the final figures to within $50,000 of the preliminary estimate. The following are the revised figures of the mineral production for 1920; those of 1918 and 1919 also being for comparison.

	Customary Measure	1918.		1919.		1920.	
		Quantity	Value	Quantity	Value	Quantity	Value
Gold placer	Ounces	16,000	$ 320,000	14,325	$ 286,500	11,080	$ 221,600
" lode	"	161,674	3,403,812	152,426	3,150,615	120,018	2,481,392
Silver	"	3,498,172	3,215,870	3,403,119	3,592,673	3,377,849	3,235,980
Copper	Pounds	61,483,754	15,143,449	42,459,339	7,939,896	44,887,676	7,832,899
Lead	"	43,899,661	2,928,107	29,475,968	1,526,855	39,331,218	2,816,115
Zinc	"	41,772,916	2,899,040	56,737,651	3,540,429	47,208,268	3,077,979
Coal	Tons, 2,240 lb.	2,302,245	11,511,225	2,267,511	11,337,705	2,595,125	12,975,625
Coke	"	188,967	1,322,769	91,138	637,966	67,792	474,544
Miscellaneous products	....	....	1,038,202	....	1,283,644	....	2,426,950
			$41,782,474		$33,296,313		$35,543,084

Taken altogether, the production for last year cannot be considered other than satisfactory. British Columbia, it must be remembered, is essentially a base-metal province, and in the past a large amount of the gold and silver production has been obtained as a by-product in the recovery of lead and copper. In the case of silver, last year proved an exception to this rule, a large proportion of the silver coming from the Dolly Varden and Premier mines, neither of which are base-metal mines. Taking into consideration, then, the slump in base-metal prices during the last four months of last year, it would not have been surprising if the total value of the mineral production had fallen behind that of 1919.

Turning to the individual items, as was to have been expected with the high cost of labor and supplies throughout the year, the gold output shows a decline of some 32,000 ounces. To all intents and purposes, placer mining was at a standstill throughout the year, the Nickel Plate mine, one of the principal producers, after maintaining its production throughout the period of the war at the expense of keeping up its ore reserves, was forced to close early last fall. The Premier mine, from which great things were expected, unfortunately experienced a strike of its employees during the heart of the shipping season, and consequently it was unable to transport much of its output to tide-water and thence to the smelter.

Silver.

The silver production shows a decline of some 25,000 ounces, and would have fallen off considerably more but for the splendid production from the Dolly Varden mine, which alone contributed 831,638 ounces. The mines in the Slocan district, which has always been the principal silver, lead, and zinc producing district of this province, were closed by a protracted strike during the early part of the year, and again on account of the low prices of base-metals during the latter part. The silver production from this district was less than half that of 1919.

Copper.

The increase in the copper output was entirely due to the splendid work done by the Granby Company during the latter part of the year, and in the face of a declining copper market. At one time during the early part of the year this company seemed to be in an exceedingly precarious condition, largely due to its unfortunate coal-mining investment, necessitating the borrowing of large sums of money at a high rate of interest. Conditions are completely changed now, owing to the pluck of the directors in pushing forward in spite of seemingly insurmountable difficulties and the splendid work of H. S. Munro, who took over the management of the company's British Columbia properties last June. Since then he has reduced the cost of the production of copper from 18.38 to 12.44 cents per pound—a really remarkable achievement. The Britannia mine closed last fall, and was unfortunate in having its mill burned down last February. At the present time the Granby is the only copper concern producing any appreciable amount of metal in the province. A small amount is being produced at Trail from the Consolidated Company's Rossland mines' gold-copper ores.

Lead and Zinc.

The marked increase in the lead output is due entirely to the splendid way the Consolidated M. & S. Co.'s Sullivan mine has developed. This mine has increased its output 250 per cent., and has contributed two-thirds of the lead output of the province.

The falling off of the zinc output your correspondent is inclined to attribute to what he believes to have been a marked error in last year's figures. The Fort Steel district, which really means the Sullivan mine, as it is the only zinc mine of any importance in the district, was credited with a zinc production of 46,460,703 pounds in 1919, while the Consolidated Company, the owners of the mine, claim a production of some twenty million pounds less. This would give an increase of some ten million pounds of zinc last year, instead of a decrease of that amount.

Coal.

The coal production shows a slight increase and the coke production a slight decrease. So far as the decrease in coal is concerned, it is due to the method by which the statistics are compiled. In previous years the Granby Company has bought its coke from Fernie; in 1919 it started to produce its own coke, and last year made all it used. As the company buys coal from itself and makes its own coke at the smelter, instead of buying the coke, the province is not credited with the coke production. Besides the 67,792 tons of coke produced at Fernie, the Granby Company charged 122,724 tons of coal into its

coke-ovens at Anyox, and obtained therefrom 75,690 tons of coke, 884,394 gallons of tar, 296,394 thouand cubic feet of gas, 151,862 refined motor fuel and 2,466,355 pounds of ammonium sulphate.

Other Minerals.

With the exception of 600 tons of manganese ore produced from a comparatively new discovery, on Cowichan Lake, Vancouver Island, no other ores of importance were produced.

The non-metallic minerals included 7,500 tons of fluorspar concentrate, valued at $175,000; 1,100 tons of magnesium sulphate; 4,500 tons of iron pyrite, and arsenic, which was shipped in the form of gold concentrates and valued at $22,000. A small quantity of talc also was produced. The Portland cement output was valued at $800,000. Building stones, clay products, crushed rock, and smelter fluxes completed the list of non-metallics.

Mining Notes.

The Hon. John Oliver, Premier, has announced that, with the exception of the east coast of Vancouver Island, the Groundhog, and the Peace River district, the Government has removed the reservation that was placed on all coal lands in the Province, and that now the whole Province, with the exceptions named, which already has not been taken up is open for location.

The Taylor Mining Company has re-commenced work at its Dolly Varden mine, in the Alice Arm district, and is re-opening the railway. It is understood that work will be confined pretty closely to development, which had been allowed to fall behind last year in an effort to make a large production while the price of silver was high, and that only ore mined incidental to development will be shipped. Some 3,000 tons that was mined when the heavy snow closed the railway last December will be shipped as soon as the necessary repairs have been made to the line.

The Nelson branch of the British Columbia Prospectors' Protective Association has appealed to Sir Henry Drayton, Minister of Finance, to establish a fund from which mine owners can draw to cover part shipments of ore made to the Trail smelter. Under existing conditions the Consolidated M. & S. Co. will give only warehouse receipts for the metal content of custom ores received, and the Canadian banks are chary about advancing funds on these receipts. On the other hand, the Provincial Government demands that miners shall be paid not less frequently than semi-monthly and the supply houses refuse to give long credits, consequently unless a company has a considerable cash reserve it is impossible for it to operate. This condition is having a very bad influence on mining in the Kootenays, where there are many small individual owners.

W. F. Ferrier, mining engineer of Toronto, and a well-equipped party are spending the summer exploring the upper branches of Findley River, a tributary of the Peace River in northern British Columbia, for placer gold. During the war Mr. Ferrier was employed in exploring for platinum by the Munition Resources Commission in this and other districts.

Considerable excitement has been caused by the discovery of asbestos in serpentine on Mount Sproat, about 25 miles south of Revelstoke on the Arrowhead branch of the C. P. R. Ikeda Brothers, of the Ikeda mines, on Queen Charlotte Islands, have made an examination of the discovery, it is claimed, in the interest of the Japanese Government. Engineers representing New York and Vancouver interests also have made examinations. The deposit has been traced for some 400 feet, and the fibre is said to run up to four inches in length and to be of a good quality. Asbestos has been discovered in several other parts of the Province at different times, but, up to the present, the fibre always has been brittle and unweavable, and consequently of comparative little value. Whether the last discovery will prove to be of a better quality remains to be seen

The first 100-ton unit of the concentrator at the Premier mine, in the Salmon River district, has been put into operation, and gradually is being tuned up to capacity. There is ample ore on the dumps to keep it busy for the rest of the year. Work on the eleven and a half mile aerial tramway is progressing well.

There is a report to the effect that the Imperial Oil Company has struck a small flow of oil at Pouce Coupe, near the Alberta-British Columbia interprovincial boundary, at a depth of 80 feet. Oil seepages have been observed along the banks of the Pouce Coupe River, a tributary of the Peace River, and for that reason the Imperial company started to drill a few days ago. They have erected an extra strong California oil-rig, capable of boring a 21-inch hole and penetrating to 4,000 feet. Work of starting was delayed by the unusually wet May and the bad transportation conditions over the wet roads.

NORTHERN ONTARIO NOTES.

A new ore body has been located in the deep levels of the McIntyre mine, Schumaker, Porcupine District. A 50-foot width of gold ore running $20 to the ton, has been shown by a cross cut.

It is reported that the Sylvanite Gold Mine, Limited, is to resume work on its Kirkland Lake property. This was a very promising property when first developed and prospects appear favorable for a very good showing.

Development work at the Bousquet Gold Mine, on the Algoma Central Railway is progressing. Extensive lateral work is planned at the 100-foot and other levels.

The Government Testing Laboratories at Cobalt have been well patronized by shippers of ore, but *The Northern Miner* (Cobalt) in a recent issue points out that the Laboratories might well be used to greater advantage by gold property developers in the making of test runs of gold ore to determine the best methods of treatment. This would prove a very valuable service, it is claimed, for operators who have not as yet equipped their properties with mills, and such tests would also make the Laboratories self-sustaining.

Two claims in the Kirkland Lake district, formerly owned by Dr. C. V. Comfort, of Rochester, N.Y., and adjoining to and immediately west of the Ontario Kirkland property, will be developed this season by a company recently formed for that purpose under the name of Comfort-Kirkland Mines, Limited. Rochester, Toronto and St. Catharines men are interested and the operators are confident that the good results obtained in Ontario-Kirkland will be found in the Comfort claims.

KIRKLAND LAKE NOTES.

During June the Wright-Hargreaves mine produced approximately $51,000 with a daily output of at least $2,000. Their mill has been treating an average of 150 tons of ore daily and runs from $15 to $16 a ton in gold.

The Teck-Hughes mine has recently been treating an average of between 115 and 120 tons of ore daily, averaging approximately $10 per ton in gold.

The Lake Shore mine during June produced $52,539.92 of gold recovered from 1,656 tons of ore treated, making an average of $31.64 per ton in gold—a record for the mine.

EXHIBITORS IN CHEMICAL AND METALLURGICAL SECTION, CANADIAN NATIONAL EXHIBITION.

The following companies have taken space in this Section in the Process Building:

Brunner, Mond Canada, Limited.

This company through its agents in Montreal and Toronto, distribute soda ash and various grades of causticised soda to the trade. The plant is at Amherstburg, Ont., and each year their various grades are shown and samples distributed.

Canadian Industrial Alcohol Co., Limited.

Industrial alcohol in all grades as per recent regulations are shown. Various uses of alcohol and products which require it in their manufacture are illustrated. The exhibit will be most interesting to chemists and educational from the public standpoint.

Canadian Salt Company, Limited.

The chemical side of this industry is demonstrated. Salt as a chemical base is a novelty to the public,

Canadian Hanson & Van Winkle Company, Limited.

Every chemist interested in electroplating and electroplating equipment and chemistry will visit the display of this company.

International Nickel Co., Limited.

This company always has a most attractive display of nickel products, alloys and machinery parts made with nickel alloys. A comprehensive view of the whole nickel industry may be obtained at this booth.

National Analine & Chemical Company.

This will be the first effort of this company in this line in Canada. Their wonderful exhibits in the United States are known to a few Canadians, but chemists and textile people will be interested in seeing their display of dyes and colored fabrics.

Nichols Chemical Company, Limited.

As manufacturers of heavy chemicals the company is well known in Canada. Besides commercial products they will demonstrate a magnesium zinc, fluosilicate, cement hardener.

Ontario Oil & Turpentine Company, Limited.

A unique display of natural magnesium sulphate from British Columbia will be the contribution of this company. The natural salt is very pure, and the large cakes displayed have been receiving attention by all users. The company is now prepared to show the trade packages and grades of crystals of various sizes.

T. E. O'Reilly, Limited.

This leading brokerage house represents a large number of companies whose various chemical products, suitable for all industries are represented. Chemicals of Canadian, British and American manufacture will be shown.

Watson Jack & Company, Limited.

Their display of dyed fabrics from Canadian mills and dyestuff chemicals has always received close attention. This year, we understand, they will specialize on some English-made dyes and dyehouse machinery. They again invite visiting chemists to use the desk accommodation they reserve for the benefit of members of the Society of Chemical Industry and others.

A new coalfield, containing an immense quantity of smokeless coal, has been discovered in Shantung, says the "North China Daily News." A company is now being organized with a capital of $500,000 to develop the field.

THE COMPRESSED GAS INDUSTRY IN CANADA.

The Dominion Bureau of Statistics, Ottawa, has prepared a report on the compressed gas industry in Canada. The year 1918 is the latest year reported on. The following extracts from the report should prove of value to our readers:

The 14 establishments making compressed gases in Canada in 1918 produced 5,484,755 cu. ft. of acetylene dissolved in acetone, valued at $138,881; 33,880,000 cu. ft. of oxygen at $674,693; and 2,742,632 cu. ft. of carbon dioxide worth $221,001. By-products from the same plants were valued at $13,696.

Three plants bought acetylene for the purpose of compressing it into cylinders containing acetone in which form this gas is marketed; seven made both acetylene and oxygen, and four made carbon dioxide.

The widespread demand for the products of this industry is reflected by the location of the fourteen plants, four of which were in Manitoba; three in Ontario; three in Quebec; two in Nova Scotia and one in each of the provinces of Alberta and British Columbia.

The total investment in these plants amounted, at the end of 1918, to $1,736,193, of which $793,278 was the value of lands, buildings, machinery and tools, and $616,455 the value assigned to materials on hand, stocks in process, finished products, fuel and miscellaneous supplies on hand. The balance of $326,460 represented cash, trading and operating accounts and bill receivable.

Materials Used and Products Made.

The cost of the materials used for manufacturing was $89,042, while the products made had a value of $1,048,271. The increase in value due to the process of manufacture appears to be enormous, but comparison of these data is hardly fair since although the oxygen used is free as air, the work of abstracting it and bottling it up for commercial uses is considerable and necessitates heavy investments in machinery and equipment, on which earnings have to be made. The compressed gas industry thus differs from most other manufacturing operations in that its principal expenditures are for plant, upkeep and power.

The accompanying table shows the quantity and cost at the works of the materials used during the year. Five plants failed to specify the quantity of calcium carbide used but included it with "All Other Materials." More complete returns are being obtained now, so that subsequent reports from this Bureau will contain more specific data than it has been possible to present in this report.

Materials Used.

			Selling value per 1,000
Sulphuric acid, lbs.	5,000	$ 175	$ 0.035
Acetone, lbs.	25,848	9,967	0.385
Acetylene, bought by 3 firms, 1,000 cu. ft.	1,787	10,073	5.636
Calcium carbide, tons	82	4,922	60.024
Coke, tons	1,851	29,662	16.024
Water	....	73	....
Caustic soda	....	67	....
All other materials	....	34,103	....
Total		$89,042	

Products.

Kind.	Quantity.	Cost.	Cost per unit
Acetylene dissolved in acetone, cu. ft.	5,484,755	$138,881	$25.30
Oxygen, cu. ft.	33,880,000	674,693	19.90
Carbon dioxide, cu. ft.	2,742,632	221,001	80.50
Other by-products	......	13,696	....
		$1,048,271	

Other firms produced a considerable quantity of chlorine and hydrogen during the year, but consumed the whole

production in their own plants, the former in the manufacture of bleaching powder and liquor, the latter for the hydrogenation of oils. The production of these two gases is considered in the reports on the industries under which the firms producing them are listed, namely, "Miscellaneous Drugs and Chemicals" and "Soaps."

General Comments.

The selling value of the products has been shown to be $1,048,271, so that the earnings of the industry amounted to $506,262. On an actual money investment of $1,736,193, previously mentioned, the rate of earnings is found to be slightly over 28%, which may be taken as indicative of the satisfaotory financial condition of this industry in Canada.

Practically all the oxygen made was produced by the liquid air process. By this means air is compressed, cooled and expanded by a continuous process until it liquifies. The nitrogen, for which there is no market, is then boiled off and discarded, leaving the oxygen to be bottled and sold. A small quantity of oxygen was also made by the electrolytic process. Oxygen is used principally in conjunction with acetylene in the oxy-acetylene blow pipe for cutting and welding metals, but it also finds considerable use in hospitals, chemical laboratories and metallurgical plants. Acetylene is produced entirely by the decomposition of calcium carbide in contact with water. Since acetylene is liable to violent decomposition when under pressures exceeding two atmospheres this gas is compressed into cylinders containing acetone, in which it dissolves. In this condition it is safe under 10 atmospheres pressure for use in such portable lighting systems as those on motor cycles and automobiles.

Carbon dioxide, the familiar soda water gas which is used for aerated water, carbonating liquors and very extensively in the manufacture of the refreshing drinks dispensed at soda fountains is produced in this country by passing air through incandescent coke. The carbon of the coke unites with the oxygen contained in the air to form carbon dioxide gas. This gas is then scrubbed and compressed into cylinders in which form it is placed on the market.

ANNUAL REPORT OF STANDARD CHEMICAL CO.

A report, covering operations of this Company, during 15 months, ending March 31st, is available. A net profit on aperations of $340,327, is shown, but, because of writing off depreciation and the purchase of refining equipment, a loss for the period of $166,917, is indicated. President David Gilmour states: "The last nine mnoths have been a time of considerable anxiety, owing to the violent disturbances which appeared in all fields of chemical activity. The outlook at present is extremely difficult to gauge. All that can be said at this time is that the accounts show that a very trying period has been negotiated, and that the company's present financial condition, combined with the advances in technical processes, already established, point to its ability to benefit quickly from any forward movement in trade conditions."

The charges set off against the profits for the period were $507,295, including alterations and repairs to crude factories $140,630, and $97,430 for alterations in refinery at Montreal. In future, these charges will be met from a special reserve. The result of this move to improve the processes of the Company should be indicated in all future statements.

Depreciation in raw materials and partly finished products was taken at $275,000. The depreciation on buildings was taken at $200,000. Interest on debentures and bank loans was reduced from $89,927 in 1919, to $69.234, last year. Total liabilities have been reduced by $264,904, and the ratio of current assets to current liabilities has improved, since last report, from 2.75 to 1, to 3.20 to 1.

During this period of 15 months, 107,490 cords of wood had been carbonized, and sales amounted to $4,984,000. The charcoal market has remained firm, the company disposing of its whole production in Canada. About 30% of the crude plant capacity of the company is being operated; but any recovery in European conditions will benefit them, in particular, as the company had an established European market, before the war, and will have in future as demand increases.

TABLE OF STATISTICS OF CANADIAN CHEMICAL AND ALLIED INDUSTRIES.

INDUSTRY	No. PLANTS		Capital Invested includes value of lands, building machinery, materials on hand and bills receivable		COST OF MATERIALS USED		VALUE OF PRODUCTS MADE	
	1918	1919	1918 $	1919 $	1918 $	1919 $	1918	1919 $
Ammonia	3	3	432,440	511,414	205,195	129,478	409,437	331,581
Boiler Compounds	4	6	176,789	144,994	55,660	70,305	137,076	188,144
Drugs and Chemicals	36	34	20,550,661	13,495,257	11,995,916	1,957,683	20,670,178	5,090,338
Disinfectants	7	6	67,942	115,324	44,760	52,427	116,083	154,138
Dyes and Colours	3	4	194,917	245,642	135,191	156,870	222,882	279,542
Explosives	11	8	19,172,539	12,840,037	23,025,839	2,017,306	45,402,892	4,495,609
Fertilizers	15	15	3,064,111	3,331,403	1,573,582	1,289,785	2,562,688	2,249,621
Gas, illuminating and fuel	38	38	26,937,885	26,972,854	3,456,396	4,046.563	7,282,147	7,213,544
Glass	11	13	7,443,525	7,231,774	2,056,739	2,267,686	6,662,116	7,171,006
Glue	11	13	1,562,086	1,620,433	812,923	748,051	1,488,147	1,510,112
*Gold Refining	4	...	840,917	....	3,133,073	....	4,331,010	....
Ink	14	16	1,022,089	1,234,672	876,672	969,595	1,746,935	2,019,037
Leather	139	113	28,435,806	34,599.542	23,681,659	34,283.896	35,357,450	46,996,298
Liquors, Distilled	6	5	10,018,168	8,154,002	2,271,178	724,268	2,883,115	1,288,477
Liquors, Malt	63	57	32,433,507	28,119,477	6,543,058	8,093,403	16,370.946	20,169,074
Matches	3	4	2,301,622	2,493,997	771,077	1,076,788	1,545,680	2,207,221
Oils	19	18	4,493,292	3,925,103	5,759,895	7,908,060	7,080,512	9,768,699
Compressed Gases	14	16	1,736,913	1,824,911	89,042	133,821	1,063,771	1,172,778
Paints and Varnishes	45	44	15,784,610	17,830,072	9,203,530	10,835,474	17,796,518	19,506,653
Patent Medicines, etc	125	123	9,434,904	11,167,869	5,549,532	5,872,989	13,487,905	13,671,350
Soap	28	26	13,086,933	12,017,281	14,595,624	12,070,181	20,944,909	17,384,260
Starch and Glucose	12	7	3,784,664	6,332,658	4,992,705	5,709,203	7,788,742	7,953,273
Sugar	8	8	37,256,851	38,725,542	45,403,037	86,308,204	58,812,219	102,630,086
Tallow	5	5	79,117	77,251	61,933	70,762	93,627	127,053
Wood Distillation	13	13	3,612,573	5,760,395	3,319,731	1,173,473	7,634,122	2,812,037
Petroleum	10	10	35,745,410	43,158,655	24,454,575	26,264,839	37,866,907	43,256,317
Miscellaneous	18	30	14,426,783	19,741,875	2,731,486	3,813,190	9,644,632	13,408,391
TOTAL	663	630	294,097,054	301,672,404	196,799,978	218,044,300	329,492,636	332,964,639

* Included with Metallurgical Works in 1919.

CATALOGUES RECEIVED.

Pfaudler Glass Lined Steel Equipment.—Our readers are undoubtedly familiar with the name Pfaudler and from our advertising pages know that glass lined steel equipment for the chemical and allied industries and Pfaudler are synonomous. For those who would like to read something further regarding the structure and uses of Pfaudler apparatus, the eight page pamphlet under the above caption would be in order.

The pamphlet contains numerous illustrations, showing the equipment, and descriptions are given of Mixing Tanks, Jacketed Stills, Seamless Pots, Closed and Open One Piece Tanks, Evaporating Pans and Enameled Steel Agitators. A list of users of Pfaudler equipment is also given. Address the Pfaudler Company, Rochester, New York, for a copy.

UNION SULPHUR COMPANY HAVE NEW HEADQUARTERS.

The Union Sulphur Company have moved their general offices to the Frasch Building, 33 Rector street, New York City, from the quarters they have occupied at 17 Battery Place. The Frasch Building is 15 storeys high, and was built by the Union Sulphur Company. It is situated at the corner of West and Rector streets. The company will occupy four floors and will lease the balance. The building is fittingly named in honor of the late Herman Frasch, founder of the Union Sulphur Company and who, until his death in 1914 was its president.

Chemical, Oil and Metal Markets

The quotations below represent manufactures' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

CHEMICALS.

Conditions in the general chemical market underwent but little basic change during the past two weeks. Buyers are still only placing orders for their business requirements.

After careful investigation stocks are now very low in the rubber trade, and considerable activity was felt during the last week. Other trades, however, are not so low as has been believed. The majority of holders in these trades are willing to sit tight and wait developments.

There are still a few consumers who have contracts, and not being able to utilize, are offering their surplus to brokers at a little below market price, and in some instances the best price that can be got. This practice has been very misleading to buyers and it will be a good thing for the trade when these stocks are all used up.

Importation of British chemicals continue to increase, and as sterling is in the buyer's favor a ready sale is found as soon as the goods arrive.

It is pleasing to note that several large British houses are now arranging to keep stocks on this side, and give the trade terms, and in such instances considerable business is being done. If the British exporter adopted generally this method, considerable more business could be done as preference would be given to the British-made article. This would also have the effect of helping to get the Canadian dollar back to par.

Conditions are undoubtedly healthier and factories are getting back to running full time, and before the fall the Chemical market ought to again prosper.

As stated in our last issue considerable inconvenience would be caused as soon as the stocks are eliminated, and this was very noticeable during the last two weeks for certain chemicals. Enquiries were very numerous, but no goods could be found and considerable inconvenience was experienced.

Heavy Chemicals—Prices on the whole are more stable, the most noticeable declines being Calcium Chloride, $5.00 per ton. Litharge, 2c; Lithopone, 2c; Potassium Iodide, 5c; Yellow Prussiate of Soda, 2c; Zinc Oxide Lead Free, ½c to 1c.

Drugs—Manufactured goods in the fine Chemical Pharmaceutical lines held to a generally unchanged level in prices, and more business has been experienced this past month.

Advance: Nitrate of Silver, ½c; Menthol, 5c; Cassia Oil, 6c.

Declines: Cream of Tartar, ½c; Hexamethylenetetramine, 5c; Potash-Permanganate, 1½c; Ethyl Bromide, 11c; Tartaric Acid, 2½c; Rochelle Salt, 1c.

DENATURED ALCOHOL QUOTATIONS.

For the benefit of the trade and those who have occasion to use the different grades of alcohol with the denaturents allowed by latest legislation, we quote the following prices: Do you buy industrial alcohol intelligently?

	Price per Imperial Gallon, f.o.b. Refinery.
Grade No. 1 Standard—	
80% Ethyl Alcohol	
20% Methyl Alcohol	$1.12
Grade No. 2 Standard—	
70% Ethyl Alcohol	
30% Methyl Alcohol	1.15
Grade No. 1 Benzine—	
90% Ethyl Alcohol	
9% Methyl Alcohol	
1% Benzine	1.10
Grade No. 2 Benzol—	
100 parts Ethyl Alcohol 65 O.P.	
2 5 10 parts Approved Benzol	
5 10 parts Approved Nitro Benzol	
2/10 parts Approved Pine Oil	
(Steam Distilled)....	1.05
Formula No. 1 Iodine—	
8.185 lbs. of Resublimed Iodine	
4.911 lbs. of Potassium Iodide, B.P.....	2.93
(Cost of containers included).	

To a 40 Imperial Gallon barrel the above denaturants are necessary.

Grade No. 1-A—	
100 gals. of Ethyl Alcohol 65 Overproof	
65 lbs. of Sulphuric Ether	
3 lbs. of Cadmium Iodide	
3 lbs. of Ammonium Iodide	$1.70

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals and Industrial Minerals.

Inorganic.

Alum, Ammonia, lump and ground..	100 Lbs.	6.00— 6.50
Ammonium Bromide	Lb.	.. —.45½
Aluminium Sulphate, high grade, bags.	100 Lbs.	.. — 4.00
Ammonia, Aqua 26	Lb.	.11— .12
Ammonium Carbonate	Lb.	.10— .20
Ammonium Chloride	Lb.	.08— .15
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .14
Barium Sulphate (Barytes)	Per Ton	30.00—35.00

Barium Chloride	Lb.	.05—.07½
Barium Nitrate	Lb.	.. — .20
Barium Peroxide	Lb.	.. — .20
Barium Sulphate, B.P.	Per Ton	100.00—110.00
Battery Acid, up to and including 1.400 sp. gr.	Cwt.	3.00— 3.50
Battery Acid, over 1.400, up to and including 1.835 sp. gr.	Cwt.	3.50— 4.00
Bleaching Powder, 35% drums	100 Lbs.	.04½— .05
Borax, crystals	Lb.	.. —.07¾
Boric Acid, powdered	Lb.	.. — .18
Bromine (technical)	Lb.	.. — .38
Calcium Carbide, car lots, f.o.b. works	Ton	.. —100.00
Calcium Carbide, ton lots, f.o.b. works	Ton	.. —105.00
Calcium Carbide, less than ton lots, f.o.b. works	Ton	.. —110.00
Caustic Soda, ground, drum	Cwt.	5.75— 6.25
Caustic Soda, solid, drum	Cwt.	5.00— 5.50
Calcium Chloride, fused	Per Ton	50.00—55.00
Camphor Monobromate	Lb.	.. — 3.00
Carbon Bisulphide, in drums	100 Lb.	.. — .10
Carbon tetrachloride, drums	Lb.	.18— .20
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	30.00—40.00
Cobalt Oxide, black	Lb.	.. — 2.50
Cobalt Oxide, grey	Lb.	.. — 2.80
Copperas (Iron Sulphate) crystals	Lb.	.02—.02¼
Copperas (Iron Sulphate) sugar	Lb.	.02—.02¼
Copper Sulphate (Blue Vitriol)	Lb.	.07½—.08½
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 1.45
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fuller's Earth, car lots, f.o.b. Toronto	Ton	35.00—40.00
Ferric Chloride, crystals	Lb.	.13—.14½
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid, 60%	Lb.	.. — .30
Hydrofluoric Acid, 30%	Lb.	.. — .14
Hydrochloric Acid, carboys, 18	100 Lbs.	2.75— 3.00
Hydrogen Peroxide	Gal.	.95— 1.00
Iodine, crude	Lb.	.. — 4.75
Iodine, resublimed	Lb.	.. — 5.20
Iron Oxide (red)	Lb.	.05— .13
Lead Acetate	Lb.	.18— .19
Lead Nitrate	Lb.	.16— .18
Lime, grey	Ton	.. —16.50
Lime, grey, in car lots	Ton	.. —14.00
Lime (hydrated) in ton lots	Ton	.. —23.25
Litharge	Lb.	.. — .12
Lithium Carbonate	Lb.	.. — 1.70
Lithopone	Lb.	.08— .09
Magnesite, calcined	Per Ton	25.00—30.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.13— .16
Magnesium Sulphate	Lb.	.03½—.04½
Mag. Sulphate, B.P., Medicinal	Single Ton	70.00—75.00
Mag. Sulphate, Technical, car lots	Ton	55.00—60.00
Muriatic Acid, 18	100 Lb.	2.75— 3.00
Nickel Salt, single, in bbl. lots	Lb.	.. — .15
Nickel Salt, single, per cwt.	Lb.	.. —.16½
Nickel Salt, double, in bbl. lots	Lb.	.. — .15
Nickel Salt, double, per cwt.	Lb.	.. —.16½
Nitric Acid, 36 carboys	100 Lb.	.09—.09¼
Phosphoric Acid, 85%	Lb.	.43— .50
Phosphoric Acid, 50%	Lb.	.29— .31
Phosphorus, yellow	Lb.	.. — .44
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.25—.32½
Potassium, Bromide, granular	Lb.	.25—.32½
Potassium Bichromate	Lb.	.. — .32
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — ..
Potassium Chlorate	Lb.	.. — .12
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash)	Sticks	.. — .80
Potassium Hydroxide (caustic potash) small drums	Lb.	.10— .15
Potassium Hydroxide (caustic potash) large drums	Lb.	.06½— .08
Potassium Iodide	Lb.	.. — 3.80
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.65— .70
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Silver Nitrate	Lb.	.. —10.00
Soda Ash, bags	Cwt.	2.90— 3.00
Sodium Acetate, ton lots or over	Lb.	.. —.08½
Sodium Acetate, lesser amounts	Lb.	.. — .15
Sodium Benzoate	Lb.	.55— .80
Sodium Bicarbonate, 100% pure	100 Lb.	3.50— 3.75
Sodium, Bichromate, bbls.	Lb.	.12— .14
Sodium Bisulphite, powder	Lb.	.. —.09½
Sodium Bisulphite, 35	Lb.	.05½— .06
Sodium Bromide (foreign)	Lb.	.30— .35
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.. —.27½
Sodium Hyposulphite, kegs	100 Lb.	5.00— 5.75
Sodium Nitrate, refined	100 Lbs.	6.25— 7.25
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Peroxide, f.o.b. New York	Lb.	.38— .40
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	.. — 2.00
	Per Cwt. in Car Lots	.. — 1.75
Sodium Sulphite	Lb.	.. — .05
Sodium Prussiate, Yellow	Lb.	.14— .18
Sulphur, ground	100 Lb.	2.75— 3.00
Sulphur, roll	100 Lb.	4.50— 4.75
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.50— 3.00
Sulphuric Acid, 66 Be, tank cars		.. —24.00
Talc, No. 1 grade	Ton	.. —30.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	.. —18.00
Tin Chloride, crystals	Lb.	.35— .40
Tri-sodium Phosphate	Lb.	.. — .08
Ultramarine, Blue	Lb.	.15— .40
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting (English)	Ton	.. —35.00
Whiting (American)	Ton	.. —30.00
Whiting	Per Ton	35.00—40.00
Zinc Sulphate, com.	Lb.	.05¾—.06½
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.10—.12½
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.. — .55
Acetic Acid, glacial, carboys, f.o.b. Shawinigan Falls	Lb.	.. —.22½
Acetic Acid, glacial, bbls., f.o.b. Shawinigan Falls	Lb.	.. — .22
Acetic Acid, 28%, carload lots	Lb.	.. —.04½
Acetic Acid, 28%, 25 bbl. lots	Lb.	.. —.05¼
Acetic Acid, 28%, 15 bbl. lots	Lb.	.. —.05½
Acetic Acid, 28%, 10 bbl. lots	Lb.	.. —.05¾
Acetic Acid, 28%, 5 bbl. lots	Cwt.	.. — 5.85
Acetic Acid, 28%, 3 or 4 bbl. lots	Cwt.	.. — 5.90
Acetic Acid 28%, 1 or 2 bbl. lots	Lb.	.. — .06
Acetic Acid, 80%, carload lots	Lb.	.. — .12
Acetic Acid, 80%, 25 bbl. lots	Lb.	.. — .14
Acetic Acid, 80%, 15 bbl. lots	Lb.	.. — .15
Acetic Acid, 80%, 10 bbl. lots	Lb.	.. —.15½
Acetic Acid, 80%, 5 bbl. lots	Lb.	.. — .16
Acetic Acid, 80%, 3 or 4 bbl. lots	Lb.	.. —.16½
Acetic Acid, 80%, 1 or 2 bbl. lots	Lb.	.. — .17
Acetone, pure, drums or over	Lb.	.. —.19½
Acetone, pure, lesser amounts	Lb.	.. — .25
Aspirin, in 100-lb. lots	Lb.	.90— 1.05
Alcohol, Absolute Ethyl, case of 1 doz 1-lb. bottle	1-lb. bottle	.. — 2.15
Alcohol, Absolute Ethyl, in steel drums of 10 gallons capacity	Imp. Gal.	.. —15.00
Alcohol, acetone, bbls. or over	Gal.	.. — 1.40
Alcohol, acetone, lesser amounts	Gal.	.. — 1.70
Alcohol, pure, bbl., 65% O.P.	Gal.	.. —10.50
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 1.15
Alcohol, wood, 95%, half bbl. lots	Gal.	.. — 1.25
Alcohol, wood, 95%, lesser amounts	Gal.	.. — 1.30
Alcohol, wood, 97%, bbls.	Gal.	.. — 1.78
Alcohol, wood, 97%, half bbl. lots.	Gal.	.. — 1.90
Alcohol, wood, 97%, lesser amounts	Gal.	.. — 2.05
Amyl acetate, technical	Gal.	4.75— 5.25
Amyl acetate, pure	Gal.	5.75— 6.25
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — .90
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 1.40
Camphor, refined, slabs	Lb.	.. — 1.15
Camphor, refined, tal	Lb.	.. — 1.22
Carbolic Acid, white crystals	Lb.	.57— .75
Chloroform	Lb.	.55— .60
Citric Acid, domestic, crystals	Lb.	.65— .70
Coumarin	Lb.	.. — 6.00
Cream Tartar, 98%	Lb.	.25— .30
Dextrine, potato	Lb.	.. — .09
Dextrine, corn	Lb.	.. — .09
Ether, B.P. conc.)	Lb.	.. — .63
Ether, Sulphuric	Lb.	.35— .50
Formaldehyde, bbls. or over	Lb.	.. —.21¼
Formaldehyde, 200-lb. kegs	Lb.	.. —.26¾
Formaldehyde, 100-lb. kegs	Lb.	.. —.27¾
Formaldehyde, 50-lb. kegs	Lb.	.. —.28¼
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Gallic Acid	Lb.	1.25— 1.75
Glycerine, C.P., single tin of 56 lbs.	Lb.	.. — .31
Glycerine, C.P., two or more tins	Lb.	.. — .29
Glycerine (pale straw) single tin 56 lbs.	Lb.	.. — .30
Glycerine (pale straw) two or more tins	Lb.	.. — .28
Hexamethylenetetramine		1.10— 1.50
Oxalic Acid	Lb.	.20— .30
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.50
Phenolphthalein	Lb.	.. — 1.80
Pyrogallic Acid	Lb.	3.00— 3.50
Quinine	Oz.	1.00— 1.10
Saccharin	Lb.	3.50— 4.00
Salicylic Acid	Lb.	.. — .35
Starch, corn, ground, car lots	Lb.	.. —.04¼
Starch, potato, ground, car lots	Lb.	.. —.07¼
Stearic Acid, Double Pressed	Lb.	.15— .16
Stearic Acid, Triple Pressed	Lb.	.17— .18
Tartaric Acid, crystals or powdered	Lb.	.40— .45
Tannic Acid, commercial	Lb.	.45— .65

Rubber.

The following quotations on rubber are in American funds, New York delivery:

Crude.

Para, upriver	Lb.	.. —.17¼
Caucho Ball, upriver	Lb.	.. — .12

Plantation Rubber.

1st Latex Crepe	Lb.	.. —.18½
Smoked Sheet	Lb.	.. —.16½

Scrap Rubber.

Boots and shoes	Lb.	.04— .05
Automobile tires	Lb.	.. — .01
Steam and fire hose	Lb.	.. —.01¼
Inner tubes, No. 1	Lb.	.. — .08
Inner tubes, No. 2	Lb.	.. —.05¾

Tanning and Dyeing Materials

Fustic Crystals	Lb.	.30— .35
Hematine Crystals	Lb.	.25— .28
Logwood Crystals	Lb.	.34— .36
Quercitron Liquid Extract	Lb.	.09— .10
Liquid Sumac Extract	Lb.	.07— .08
Ground Sumac	Ton	75.00—85.00
Chestnut Liquid Extract	Lb.	.3½— .04
Hemlock Liquid Extract	Lb.	.06— .07
Quebracho Liquid Extract	Lb.	.5½— .06
Quebracho Solid Extract	Lb.	.07—.07½
Liquid Blended Extract (Canadian)	Lb.	.4¾—.05¼

Metals.

Aluminium, No. 1, 98-99%	Lb.	.. — .29
Antimony	Lb.	.. —.07¾
Brass, yellow ingots	Lb.	.. — .14
Brass, red	Lb.	.. — .16
Cobalt, metal	Lb.	.. — 3.50
Copper, electrolytic, small lots	Cwt.	.. —16.75
Copper, electrolytic, car lots	Cwt	.. —16.25
Copper, casting, small lots	Cwt.	.. —15.75
Copper, casting, car lots	Cwt.	.. —15.25
Gold, Pure	Oz.	23.00—25.00
Iron, Pig	Ton	.. —43.00
Lead, pig, small lots	Cwt.	.. — 6.60
Lead, pig, car lots	Cwt.	.. — 6.10
Magnesium, ribbon	Oz.	.. — 1.50
Magnesium, ribbon,	Lb.	.. —18.00
Magnesium, powder	Lb.	3.00— 3.50
Mercury	Lb.	1.10— 1.25
Nickel, shot or ingot	Lb.	.. — .40
Platinum, pure	Oz.	85.00—90.00
Silver, bar, American silver	Oz.	.. —.99¼
Silver, bar, Canadian produced, U.S. funds	Oz.	.. —.58⅝
Steel, mild, ¼ inch, base price	Cwt.	.. — 5.75
Steel, mild, 3/16 inch, base price	Cwt.	.. — 6.25
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	8.15— 8.50
Tin	Lb.	.. — .37
Zinc, sheets	Lb.	.. — .20
Zinc (spelter) small lots	Cwt.	.. — 6.85
Zinc (spelter) car lots	Cwt.	.. — 6.35

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .33
Motor Gasoline (service stations)	Gal.	.. — .37
Lighting Gasoline	Gal.	.. — .38
Naphtha	Gal.	.. — .32
Coal Oil	Gal.	.. —.20½
Fuel Oil	Gal.	.. — .08
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 1.00
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 2.25
Crude Creosote Oil, bbls.	Gal.	.. — .40
Refined Creosote Oil, bbls.	Gal.	.. — .65
Crude Coal Tar	Bbl.	.. —10.25
Refined Coal Tar	Bbl.	.. —11.50
Coal Tar Pitch, bbls.	Cwt.	.. — 2.15
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52—. 57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .10
Naphthalin Balls	Lb.	.. — .11
Alpha-Naphthylamin	Lb.	.. — .51

Flotation Oils and Naval Stores.

Rosin, Grade G, in 280 bbl. lots		.. — 9.00
Rosin, Grade W.W., in 280 bbl. lots		.. — 9.50
Turpentine, spirits, single bbls.	Imp. Gal.	.. — 1.07
Turpentine, spirits, 5 to 6-bbl. lots	Imp. Gal.	.. — 1.06
Turpentine, spirits, 5-gal. container	Imp. Gal.	.. — 1.22

Waxes, Gums, Vegetable and Essential Oils.

Essential Oils—

Cedar, leaf	Lb.	.. — 2.00
Cedar, wood	Lb.	.. — 1.15
Camphor	Gal.	.. — 6.75
Camphor, white	Lb.	.. — 1.00
Peppermint, American	Lb.	.. — 5.50
Peppermint, re-distilled, B.P.	Lb.	.. — 3.50
Peppermint, Japanese	Lb.	.. — 3.25

Vegetable Oils—

Anise Oil	Lb.	.70— 1.00
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .21
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .19
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.30— .32
Corn Oil, in bbls.	Lb.	.. — .10
Corn Oil, tank cars	Lb.	.. — .08

Cottonseed Oil, crude, f.o.b. Mississippi Valley points	Lb.	.. —.05¾
Cottonseed Oil, crude, f.o.b. Texas points	Lb.	.. —.05½
" Oil, summer yellow, f.o.b., Chicago	Lb.	.. — .07
" Oil, winter yellow, f.o.b. N.Y.	Lb.	.. — .08
Linseed Oil, raw, single bbls.	Imp. Gal.	.. — .97
Linseed Oil, raw, 3 to 5-bbl. lots	Imp. Gal.	.. — .96
Linseed Oil, raw, 6 to 9-bbl. lots	Imp. Gal.	.. — .94
Monopole Oil	Lb.	.. — .30
Olive Oil, foots, at Toronto	Lb.	.11½— .12

Gums—

Indian, No. 1A	Lb.	.. — .40
Indian, No. 1	Lb.	.. — .38
Tragacanth, No. 1, Ribbon	Lb.	.. — 4.50
Tragacanth, No. 1, Flake	Lb.	.. — 3.50
Tragacanth, Turkey	Lb.	.. — 3.75
Arabic, clear amber sorts	Lb.	.. — .18
Arabic, regular grain No. 4 and No. 6	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22½
Arabic, white sorts	Lb.	.. — .40
Arabic, powdered, No. 1	Lb.	.. — .25
Arabic, powdered, No. 2	Lb.	.. — .24

Waxes—

Beeswax, various grades	Lb.	.39— .51
Paraffin, 128°—130°, M.P.	Lb.	.. — .22
Paraffin, 118°—120°, M.P.	Lb.	.. — .19
Paro Wax, blocks	Lb.	.. — .20
Shellac, T.N.	Lb.	.. — .84

Fertilizer Materials.

Acid Phosphate	Ton	.. —30.00
Animal Tankage, per unit of Ammonia		.. — 2.00
Animal Tankage, per unit of Bone Phosphate of lime		.. — .10
Nitrate of Soda	Ton	.. —75.00
Muriate of Potash	Ton	.. —75.00
Pure Ground Blood, per unit of Ammonia		.. — 2.25
Steamed Bone Meal	Per Ton	.. —45.00
Sulphate of Ammonia	Ton	.. —65.00

C. P. Chemicals.

Ammonia, C.P.	Lb.	.. — .27
Hydrochloric Acid, C.P.	Lb.	.. — .16
Nitric Acid, C.P.	Lb.	.. — .24
Sulphuric Acid, C.P.	Lb.	.. — .15

Industrial Gases.

Hydrogen (cylinders)	per 100 cu. ft.	1.00— 1.50
Oxygen (cylinders)	per 100 cu. ft.	1.40— 2.50

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P. F. McCLEARY, Associate Editor. T. LINSEY CROSSLEY, Editor. L. E. WESTMAN, Business Manager.

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FROM THE PUBLISHERS

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EDITORIALS

GROWING PAINS.

IT is our privilege often to discuss, with different types of manufacturers, the advisability of employing a chemist. It has been the same from the beginning, and we suppose always will be, but there are some Canadian companies that are apparently making money, in spite of a supreme lack of regard for any kind of technical control and research. Any kind of efficiency engineer would revolutionize their operations. There are several fields in which the chemist has made no progress to date. The whole textile field is open to him; the leather people only know about him in a vague way; and the same is true of a number of industries which we could mention. The European chemist makes an ideal salesman, but not so in Canada. Even chemical brokers hesitate to employ him.

From the viewpoint of a trained chemist, the situation and ignorance in some plants is simply beyond belief and a disgrace to the Manufacturers' Association. We do not mean that safety devices are neglected, or anything like that, but the lack of fundamental knowledge and of planned control is beyond comprehension.

There are companies, for example, who can afford to spend $200,000 on a new plant. They grow grass on the lawn in front, in order that the public may think them up-to-date, clean, etc., but they have no technical control of their processes, in spite of the fact that they are of a type which simply cry out for such regulation. We have labored with them to employ a chemist, but they point out that others in their business do not, that he might cost $200 a month, and that they would have to spend some money on laboratory equipment. He might not prove to be valuable, and they are not given to making foolish experiments, or paying for ideas. The next minute, they will spend $10,000 on a machine, just to keep the plant up-to-date. Nothing short of the cruelest competition and startling losses will wake them up. Then their first thought is too often tariff protection only.

This problem of injecting chemists into places where they never were before is great exercise, and we invite all chief chemists in Canada to try to get some plant they know about to take a chemist. It will help to develop your selling abilities and give you a new angle on Canadian business. Chemists also make mistakes in their efforts to develop new openings for themselves. They lack general business experience. It is a fundamental truth that few manufacturers who are operating at a profit now will spend a dollar on technical control, in order that they may operate at a greater profit. The immediate big dividend curse hangs over them like a sword, and they are always playing to win their pot on the very next race. Unless the business is on the rocks and losing money, they will not change a method of working, selling or controlling. Caution is still the largest bump on the heads of our leading manufacturers. They literally hate new ideas, and the disturbing element of chemical progress. If there is no laboratory, about the only chance a young chemist has is to start in the factory and work one up as a side line. If you have special training, and are a good salesman, you may get control at once; otherwise it is not likely. Then there is that great army of foremen, who object to the chemist, because he can discover them at their old tricks of covering up their ignorance or shifting blame.

If every Canadian chemist would start right now to work up new opportunities for other chemists, he would be helping himself and Canadian industries more than by anything we can think of.

Our latest idea of a chemical doctor of philosophy is one who has secured a position, developed and made good as a chemist in a plant or industry, which never employed one before, and, with the active opposition of everyone around the place, except the president.

THE ENGINEER IN GOVERNMENTS.

HOOVER and Loucheur are the most outstanding representatives of the engineering profession in America and France to-day.

Engineers in general have given much thought to the careers of these men, who have placed the profession on a new plane of national service. They have passed from the consulting capacity, and have had intrusted to them the guidance of most important departments of their respective governments.

We are rather of the opinion that there is something inherent in the national temperament of the French and American people, which made this possible in these countries, and that this element is not as yet developed to the same degree in the British Empire.

Their promotion to executive power and place is all part and parcel, in our opinion, of the general alteration going on in the public mind as to what actually constitutes qualifications for political advancement. Parliaments must cease to be second-rate educational institutions, where relatively

ignorant and untrained minds are guarded and developed, lest they make mistakes in carrying on the business of the country. The complexity of commerce and industry now demands a previous training on the part of the representatives of the people, other than that secured through the standard methods of procedure heretofore worked out.

The work of Hoover in Europe and America is known to all of us; and the development of Loucheur has been along similar lines. He who introduced reinforced concrete to France and developed a hydro-electric system, is a member of the Government in charge of restoration work. Neither of these men conform in any way to the traditional literary, legal or military statesmen who have dominated affairs in Europe and America from the beginning.

The public has lauded, perhaps unduly, those who have secured their confidence and election, in spite of the fact that they were the little nobodies they boast about in later days. It is a fine thing for any man to attain success in the political field, in spite of all manner of handicaps, but it is very doubtful if it is a good thing for the country he lives in.

The records of our parliamentary debates and committees appointed to investigate public affairs of an industrial and technical nature, show that even the best talent available in Governments is away below par and entirely lost when anything but obvious generalities is mentioned. Either as trained business executives or engineers, they are so far below the standard of those who may address them, that were they not representatives of the people, the effort would often be given up in disgust. The cleverest of them may brush up in private but few are sought as executives when they fail in elections. If governments are to act on the advice of engineers through commissions, why not place engineers in the government?

The advent of the scientist and engineer to executive position and national power as a new experiment will be watched most carefully. The movement can still go much further without becoming unbalanced; and we would recommend to our Provincial and Dominion premiers that they follow the lead, and attempt to secure at least one outstanding man with these qualifications for their respective cabinets.

RELATIVITY.

Relatively speaking, Einstein has not quite a monopoly of that interesting subject. The Royal Society has recently conferred its fellowship on Dr. Alfred A. Robb for his work on this question.

It has been found that Dr. Robb anticipated many of Einstein's conclusions in the course of work which has been going on since 1902.

Dr. Robb has neglected the agency of the press.

PSYCHOLOGY.

ONE of the chief difficulties of the technical man in industrial life is that arising from the viewpoint of many of his fellow-workmen. It has always seemed to arouse peculiar pleasure on the part of a large proportion of workmen if they can put something over on the chemist. We recall climbing, with considerable difficulty, to the top of some eighty-foot towers in a sulphite mill to test the exhaust gases. We had brought along some Hempel apparatus and spent half a day getting results, and those results meant a good deal of trouble, some physical risk (that was in the early days before "safety first" was popular), and much discomfort. When we undertook to discuss these results with the acid maker, we occasioned much amusement and were told that we didn't get much information as the water had been turned off and on several times while we were up there.

Now, we were on good terms with this man, and it was sheer love of a joke that made him do this.

We, and most other technical men, have met another class, however, that makes scientific work difficult. That is the class which has an idea that in some way they will be the losers if the scientist attains control. This attitude can only be combatted in two ways: the first is the education of the workman, and the other the education of the chemist. The workman is suspicious and fears the ascendancy of science will mean loss of prestige, and the chemist often does not consider that tact is an essential part of his equipment. Both need to be educated into the view that success is only attained by co-operation.

CODFISH AND CHEMISTRY.

WRITING to the Weekly Bulletin of the Department of Trade and Commerce, H. A. Chisholm refers to the strong competition for the Cuban codfish market, coming from Norway, Alaska, and lately Japan.

At first sight this might not appear to be anything to interest chemists, but the point is brought out that, in spite of her very advantageous position, Canada is not controlling this natural market, chiefly on the grounds of technical preparation of the fish.

Appearance is neglected in respect to one particular point to which the attention of the fishermen has been called. The foreign cod have a white nape, whereas the Canadian cod are cured with a black nape. Higher prices are paid for white nape cod by Halifax merchants, but a few fishermen persist in curing without removing the black nape.

Fault is also found with the cure. Competing cod are so cured that they remain hard after arrival and

storage in Havana, while Canadian fish become soft and commence to deteriorate in a short time.

The Canadian fish are not so carefully washed as are their competitors, and are packed with a coarser salt, so they suffer by comparison.

It looks as if this might be a chance for some of our young chemists. The fish business will no doubt have to come to more scientific control, and in time will be as highly technical as the packing business.

This is one of our indigenous industries. The Cuban market is only one of its outlets, but that is worth about $1,500,000 annually, and we can beat all competitors in delivery. Alaskan fish pay $2.00 a box freight, Norwegian $1.50, and Canadian only $1.05.

We can also beat them by some weeks' time. Where is the chemist who will break in and clean this situation up?

PHARMACEUTICALS IN CANADIAN FORESTS.

IT will be news to many that British Columbia is now the world's chief source of supply for cascara bark. This substance, the bark of Rhamnus purshiana, otherwise called Sacred bark, or Bearwood, was found in large quantities in the Pacific States, but was exploited so rapidly as to become almost exterminated. Care is being taken to control its collection in Canada so that it may be a permanent source of revenue.

There are other plants and shrubs of value to pharmacy in the swamps and forests of Canada. These have not been developed because they have been obtained from localities in Central Europe and also because those in whose neighborhood these plants grow lack the necessary knowledge to collect them properly or even recognize them. The extremely low labor cost that prevailed in this business was also a reason why it was not developed here. As the relative conditions become more equal it is to be hoped that we shall be able to produce on a commercial scale these valuable medicinals.

We have been so busy to date in our new country that we have not discovered many of our peculiar resources. In time, some Canadian educational agency should attempt seriously to increase common rural knowledge of botany in order that we may be equipped in this regard at least as well as the peasants of Hungarian forests.

INTER-IMPERIAL TRADE.

OUR imports from the United Kingdom, which had been steadily increasing up to 1914, gradually declined during the war. Since 1919 they have been going up, and the returns for the fiscal year ending March show nearly $100,000,000 more than 1913, the best previous year.

The peak of our exports to the United Kingdom was in 1918, which included the abnormal munitions materials. Since then it has very naturally declined, but it is satisfactory to note that it is higher by $100,000,000 than the best pre-war year (1914) and that it is to about the same extent ahead of imports.

Reading many of the comments on Canadian goods as received in England, it seems that it is only necessary for Canadian exporters to pay a little more attention to matters of technical finesse to command a much larger proportion of this very fine business.

Trade within the Empire should be based on a development and conservation of resources, as nothing is gained by the sapping of one part of the Empire for the benefit of any other portion.

GETTING OUR STRIDE.

THE latest compilation of the Dominion Water Power Branch of the Department of the Interior shows a development just short of 2,500,000 horse-power installed, an available minimum at ordinary flow and 80 percent efficiency of 18,250,000 and a maximum of over 32,000,000. This actually means, with turbine installations, which average about 30 percent more than available maximum head, that we have a wheel capacity of over 40,000,000 horse-power, or about four and a half horse-power per capita of our latest estimated population.

We have only developed about six percent of it.

This reminds us of the darkey who was "not de leas' bit 'stitious, no sah, but when ah see dat skel'ton wavin' a green lantern in his bone han' ah starts away from thar, an' he says, 'Hi, thar, niggah, what yo' all runnin' foh?'

"Ah sez, 'Runnin', boss? Yo' ain't seen no runnin' yet; Ah'm jes' startin'."

One C. F. Bardorf has been elected President of the Esperanto League of America. You can never tell what these quiet men are doing on the side.

Mr. Hoover's committee of the Engineering Council, on waste, came to the conclusion that 50% of industrial waste is to be laid at the door of management while only 25% is the fault of labor.

If the line of promotion to management were more frequently from the laboratory and the mill than from the office and salesroom, some of that 50% might disappear.

Mr. Henry Ford bought a decadent railroad and made it pay. Perhaps he could make that Mussel Shoals nitrogen plant pay, also.

The Manufacture and Care of Automobile Storage Batteries.

By J. T. BURT-GERRANS.*

THE present-day popularity of the gasoline automobile was made possible because the Brush-Faure pasted-plate type of lead storage battery, invented in 1880, had been shown to have sufficiently high capacity per unit weight. No other battery can equal it for any vehicular service, the nearest approach being the Edison nickel-alkali-iron battery, used for some classes of electric trucks, but never for starting on the gasoline car.

In the automobile battery the active material consists of lead peroxide and sponge lead, both formed electrolytically in a lattice or grid which holds the material and serves as a conductor for the current. The grid is cast in steel molds from a lead-antimony alloy containing about 5 to 8% of antimony. Pastes of the consistency of stiff putty are forced into this grid, either by hand or machinery, and then converted into lead peroxide as a positive plate and sponge lead as a negative plate by the action of an electric current in a bath of dilute sulphuric acid. The pastes are always made from red lead, litharge and sulphuric acid. Other substances such as carbon, barium or magnesium sulphates, pumice, etc., have been added for various purposes but the best batteries use only the lead oxides and acid. Machine pasted plates are harder and denser, but do not have the same capacity at high discharge rates as hand pasted plates. An experienced paster will rapidly turn out very uniform plates with as few as eight motions of the spreader.

It is highly important that the raw materials be very free from impurities and also that none creep in during the process of manufacture. Copper, iron, arsenic, platinum, chlorine, nitrates and acetates, are very injurious to a battery even in small amount. These induce local action at the plates and hasten self discharge. The writer has seen a distinct line of bright copper formed near the top of a negative grid due to the presence of 0.25 per cent. of copper in the active material. Platinum may come from the acid, the other metals from the lead and antimony, chlorine and nitrate from the water used and acetates from imperfectly prepared wooden separators. The points of entrance of the copper above noted were located in a bronze mould used for casting the grids and from a copper collar on the lid of a paste mixer, through which the stirring shaft passed.

Charging the Plates.

After being pasted the plates are dried on racks in air for from seven to fourteen days and then placed in tanks holding from twenty to one hundred plates covered with sulphuric acid of about 1.15 Sp. Gr. and formed. Dummy plates are placed at the end of each tank so that all the plates may receive a uniform amount of current. The English practice is to use a forming charge of one ampere per pound of active material, while the American practice is to use a current density of from three to six amperes per square foot of plate surface and pass about twice the theoretical quantity of electricity required. In some small plants instead of forming as above, the plates are assembled in the cells without sealing and given a short charge at three amperes per square foot of positive plate surface, but this is for obvious reasons not considered good practice. The forming current is adjusted so that there is little or no gasing at the plates and is consequently reduced towards the end of the operation. The resulting plates are compact, sufficiently porous and have good contact between the active material and its support.

When formed the plates are drained and either assembled at once into the elements and placed in the cell jars, or are soaked in water to remove the acid, dried, and assembled as needed. Positive plates are connected in groups containing an even number of plates by a strap of lead burned on to the lugs at the top and the negative plates similarly into groups with odd numbers. Every cell has one more negative than positive plate. The plates of a positive and negative group are interleaved and separated by a thin grooved wooden or perforated hard rubber separators, sometimes both. When the latter is the case the rubber is always placed between the positive plate and the wood. They are thought thus to retard the softening of the wood and lessen the erosive action of gas bubbles, but they also reduce the conducting area of the electrolyte about 60% and are not practical for high rates of discharge. The assembled groups constitute an element and are placed in the cell, the cover sealed on with a low melting pitch compound leaving the connecting posts, which are burned to the top of the lead strap, protruding from the cover. The cells are boxed in units of three, six, or ten cells depending on the type of service required, filled with acid and given an initial charge to reduce any lead sulphate formed between the end of the forming charge and the finishing. The batteries are ready for service after the connectors have been burned on to the posts.

Batteries for Vehicle Work.

Vehicle batteries are put to the following types of service: Electric trucks requiring 80 to 90 volts and 25 to 400 amperes; Electric pleasure cars requiring 60 to 80 volts and 25 to 50 amperes for from four to six hours. Forty to sixty miles per charge are expected and a total mileage of about 8,000 is looked for, but by careful driving with a close watch kept on the ammeter, 9,000 to 12,000 miles may be obtained.

Ignition: Requiring 6 volts ¼ to 1 ampere intermittently for hours.

Lighting: Requiring 6 or 12 volts, 4 to 6 amperes for from a few minutes to all night.

Starting: Requiring 6 volts, 100 to 600 amperes for from three seconds to one or two minutes.

In the present day cars the battery is designed to take care of the three latter services simultaneously. The plates are nearly square, have an area of from fifty-four to sixty square inches per plate and from nine to fifteen plates per cell. Large capacity per unit weight is obtained by casting the grids as thin as possible, ⅛ to 5/32 inches being the limit of good casting. The weight of the grid and its active material are about equal and approximate ½ lb. each per plate. There are two manufacturers who claim capacities double those of standard cast grids by using a very thin plate (1/32") stamped

*Address given before Toronto Section, Society Chemical Industry, April 24, 1921. Original address illustrated with slides and samples of equipment.

from cast sheets of lead alloy but these have yet to be proved in service. For electric trucks and cars the plates differ only in shape and size, being about twice as long as wide and having an area of about double that of the other type.

Batteries must have the required capacity at temperatures ranging from 35 degrees below zero Fahrenheit, in such regions as Western Canada, to 100 or 105 degrees in the tropics. In addition to this, they are expected to be good for at least two years in a car. While the battery manufacturers try to make their instructions for care and operation as simple as possible, very many car owners and drivers are ignorant and careless, consequently the usage a battery frequently receives is sufficient to reduce the period of its usefulness to a few months. The writer has known of batteries which, with intelligent care, have given good service during all seasons for five years.

Batteries for starting are rated on the amount of current they will deliver at an initial temperature of 80 degrees F. for twenty minutes, while the voltage per cell drops to 1.65. For lighting the ampere-house discharge

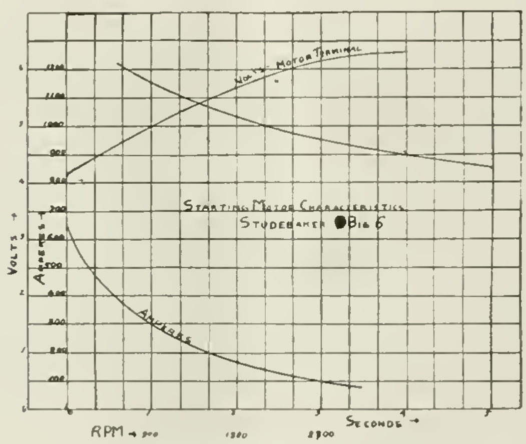


Fig. 1—Curves Showing Battery Voltage, Amperage and Terminal Voltage Developed by Starting Motor.

required to reduce the voltage to 1.8 per cell at the same initial temperature when 5 amperes flow is a measure of its lighting ability. Thus a starting and lighting battery rated at 100 amperes should give this current for twenty minutes, or five amperes for twenty hours, for the final voltages cited.

For complete discharge the gravity changes from 1.275 to 1.300 initially to 1.160 to 1.140 finally. Ignition and electric vehicle batteries are rated the same as batteries for stationary service, viz., the normal eight hour rate.

Operating Automobile Starters.

In cranking and starting motor the initial surge of current is very high since the motor at rest constitutes a short circuit between the battery terminals when the starting switch is closed. As the starter gathers speed the counter electro-motive force developed opposes the battery voltage, and the current from the battery is reduced. This is very well shown by the curves of figure 1, which shows the battery voltage and amperage, as well as the terminal voltage developed by the starting motor. As the engine develops speed the motor acts as a generator. Its E.M.F. being higher than that of the battery, it sends current into the battery recharging it. On a real short circuit without any development of counter E.M.F., batteries for small cars will give very much greater currents than are required for the stiffest engine. The curve shown in Figure 2 was obtained by reading the current

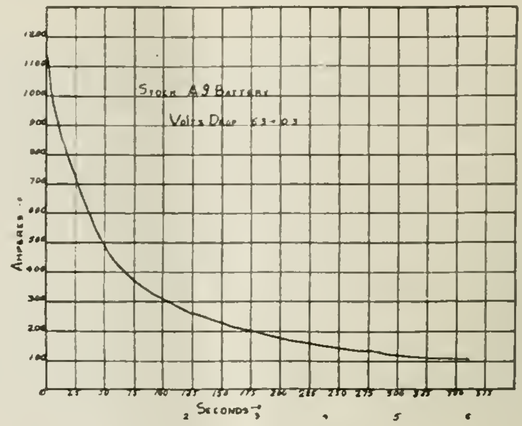


Fig. 2.

delivered continuously by an 80 ampere battery when the external circuit consisted of less than 2 ft. of ¼ inch x 1 inch copper bus bar, the ammete shunt and mercury cup switch, the current values being noted every second for the first five seconds, subsequently every five seconds and then fifteen seconds for six minutes. With the same circuit, a 120 ampere battery delivered 1,820 amperes at the end of the first second, and the 260 amperes at the end of five minutes. But it is seldom that a battery is called upon to operate a starter for more than a few seconds at a time. It is more important, therefore, that the battery deliver the required current a large number of short periods. The writer had the opportunity of timing the owner of a new Ford car for some months last winter. This man seldom held his starting switch closed less than 10 seconds, and frequently as long as 20 seconds. Often on a cold morning, when the engine was stiff he would require four or five trials before he could get his engine going. This suggested an intermittant discharge test on a battery which was carried out on a single cell from

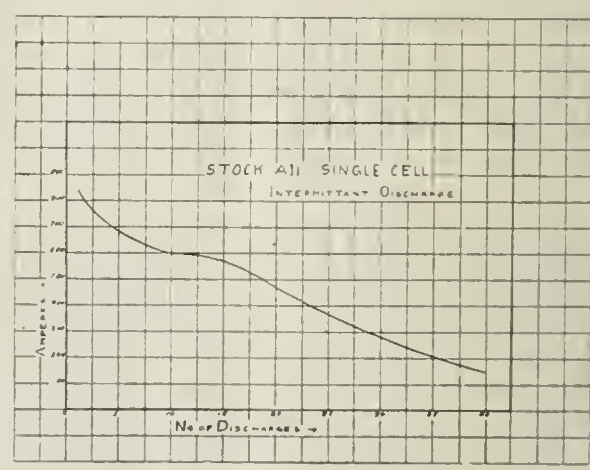
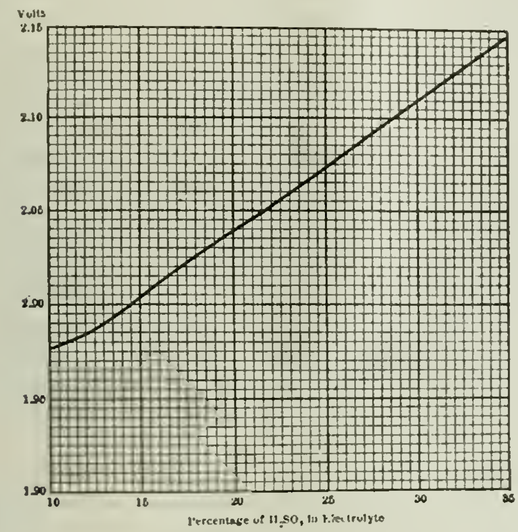


Fig. 3—Showing Result of an Intermittent Discharge Test on a Battery.

100 ampere battery with the result shown in Figure 3. In the test the same circuit as that of the test for Figure 2 was used and the readings taken just before the opening of the switch. For the first twelve discharges the dis-

charge was five seconds and rest 10 seconds, and for the balance of 44 discharges the discharge was continued for ten seconds with a rest of 50 seconds between each discharge. At the end of the fortieth discharge the open circuit voltage was 1.94. In service at ordinary temperatures 3 to 5 seconds' discharge is all that is required generally with long periods between starting. It is not surprising, therefore, that with the reserve power possessed



Variation of Cell Potential with Electrolyte Density.

Fig. 4.

a starting battery will give full capacity when as much as 2/3 of the active material has been shaken from the grids or when the cells are only half full of electrolyte, conditions which are sometimes met with, especially the latter. One owner of a car did not put a drop of water in his battery for four months of summer driving and was surprised to find that it failed to crank his engine one morning.

During discharge both the lead peroxide and sponge lead of the plates are converted on the surface of the plates into lead sulphate by the action of the electric current and sulphuric acid, and water is produced. The reaction is reversed when charging. Some of the water is decomposed and hydrogen and oxygen gases escape, much less on discharge than charge. The concentration of the electrolyte and consequently its specific gravity change. The potential of the couple also changes. If the rate of reaction is less than the rate of diffusion of the acid through the solution in the pores of the plates, the potential change is proportional to that of the gravity. The specific gravity is thus the easy and universal means

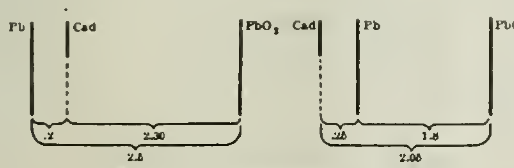
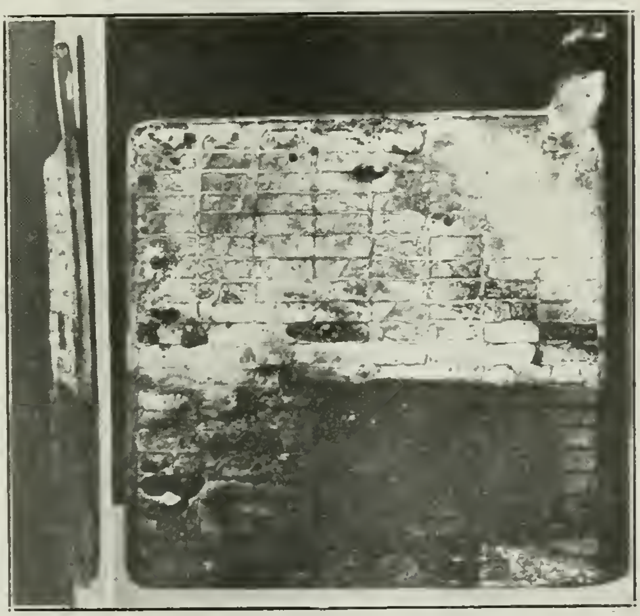


Fig. 5.

of indicating the condition of a battery. Figure 4 shows the variation of cell potential with the concentration of the electrolyte between the limits of Sp. Gr. 1.150 (15% acid) and Sp. Gr. 1.300 (40% acid). The use of the gravity syringe is not very accurate but is sufficiently useful to the layman to enable him to tell that his battery does or will soon need charging. When supplemented by the use of voltmeter and a cadmium test electrode a much better idea of the available power in a battery may be had. In Figure 5, which represents the potential relation between the plates and cadmium for charged and discharged conditions, it will be observed that the negative reverses its polarity with respect to the cadmium, being negative to the cadmium at the beginning of the discharge and positive at the end. It is seldom that a battery leaves the factory with the negative plates fully charged, but after a few cycles in general use the negative picks up to its full value.

Proper Care of Batteries.

A battery will stand up under abuse without audible or visible complaint until failure, notwithstanding its strength and reserve power, is sudden and complete. Regular weekly inspection and testing then are the surest means of insuring satisfactory service and long life. The many troubles and failures occurring are almost entirely due to neglect or wrong treatment. They occur in every part of the battery, in the jars, separators, plates and electrolyte. Jars develop cracks and leaks by allowing heavy tools to fall on the top, by being dropped during



Figs. 6 and 7—Buckled Plates Viewed from Two Positions (left, edgewise), (right, frontwards).

removal from or replacement in a car and in various other ways. For strength a well built Pyralin jar is far superior to a rubber jar. The writer has seen a cell with Pyralin jar complete and filled with acid, dropped four feet to a concrete floor without developing any sign of crack or leak. The separators which are the weakest part of the whole structure, allow internal short circuiting of the plates from various causes. Low electrolyte permits the drying and splitting of the upper parts of the separators and these cracks catch the active material shed by vibration or overcharging. When a battery is charged with low electrolyte the acid becomes greatly concentrated, which results in the rapid softening and charring of the wood. Acid of any strength will eventually soften the separator, which renders it easily pierced by rubbing against the plates due to the vibrations set up

while driving over all kinds of roads. Piercing also results from buckling of the plates. Frequent excessive overcharge, short circuit discharge long continued, long periods of idleness in a discharged condition which allowed the accumulation of large quantities of lead sulphate in the plate the specific volume of which is about three times that of either lead sponge or peroxide, failure to give the battery full charge because of the improper adjustment of the current from the generator for the daily mileage of the car, low electrolyte, addition of water at

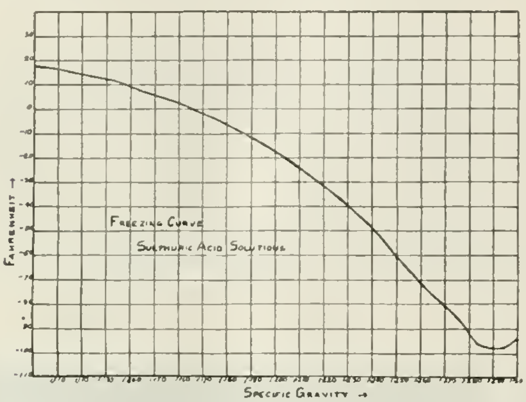


Fig. 8—Curve Showing Freezing of Electrolyte of Low Specific Gravity.

any time other than just before charging which permits of self-discharge due to concentration difference between the top and bottom layers of the electrolyte, distortion of the active material by freezing of low gravity electrolyte, all tend to buckle the grid, and induce loss of power and shedding by loosening of the contact between the active material and its support.

Figures 6, 7 and 8 show the result of some of the above conditions.

A Possible Source of Lead Poisoning

By A. F. G. Cadenhead and A. G. Jacques.

A LARGE part of the pipe tobacco used to-day comes on the market in packets lined with lead foil. Due to the opening and closing of the packet, and friction during pipe filling, the lead foil shows a tendency to break into small pieces which find their way into the tobacco, and in the experience of the writer into the pipe. It seemed possible that the lead, in some form, might find its way into the smoker's mouth during smoking.

Two considerations suggest this possibility. First, the strongly reducing atmosphere in the pipe-bowl during combustion which would tend to prevent the formation of the comparatively non-volatile oxides of lead; and second, the temperature in the pipe-bowl, which is estimated, from the depth of the glow, to vary from 300 to 500° C. According to Demarcay (Comptes rendus, 1882, 95, 183) lead volatilizes at 360° C.

The object of the investigation was to ascertain if the conclusion drawn from these considerations was warranted.

The apparatus consisted of a piece of hard glass blown into the shape of a pipe-bowl, and of approximately the same cross-section. This was connected by a short stem to a wash-bottle of the Friedrich's type, and this in turn to an aspirator. The wash-bottle was filled with concentrated nitric acid.

In carrying out the experiments, the bowl was filled with 5 gms. of tobacco in which was mixed exactly one gram of shredded lead foil from a tobacco packet.

The whole apparatus was connected up and the aspirator started gently. The tobacco was ignited and air was drawn through at a rate approximating that in smoking. As the smoke passed into the wash-bottle the acid in the latter gradually took on a brown color showing oxidation of the smoke material. The smoke passing out was pure white. While the combustion was proceeding, a quantity of tar collected in the stem of the pipe. This tar was not used in the subsequent evaporation. A further, and similar condensate in the worm of the wash-bottle was washed out and dissolved with nitric acid and added to the main volume of acid in the wash-bottle. After the tobacco had been burned the nitric acid was evaporated. Fresh acid was added until all organic matter had been destroyed and then 2 cc. of conc. H_2SO_4 and evaporation continued to white fumes. The solution was diluted to a volume of 300 cc and allowed to stand. A small but distinct precipitate of $PbSO_4$ took place. This was filtered, ignited and weighed as $PbSO_4$.

This result was checked in a separate experiment by determining the amount of lead remaining in the ash after the run. Five grams of tobacco and 0.5000 of lead foil were used.

After the experiment, an examination of the ash showed that at the surface there were yellowish nodules which were, presumably, PbO. In the interior, and at the bottom of the bowl, there were some globules of metallic lead with a thin superficial coating of oxide.

The ash was now leached with warm nitric acid, the solution diluted to 100 cc and filtered. H_2SO_4 was added to the filtrate which was then evaporated to white fumes, diluted, and the lead estimated as before. The amount of $PbSO_4$ weighed was 0.7236 gm., equivalent to 0.4975 gm. of lead. This showed a loss of 0.5% of the lead originally taken, and agrees with the figures given below, as it is certain that the tar in the pipe stem which was discarded would contain a large proportion of that volatilized and passing over with the smoke proper. As the object was merely to discover whether any lead would pass over with the smoke, the tar above referred to was not examined.

Charge (gms.)		Found in Smoke (gms.)		Percent
Tobacco.	Lead	$PbSO_4$	Equiv. Pb.	Volatilized.
5.0	1.0000	0.0056	0.0038	0.38
5.0	1.0000	0.0020	0.0013	0.13

No attempt was made to ascertain the form in which the lead passed over.

Summary.

It has been shown that lead will pass over into the smoker's mouth during smoking if there be any present in his tobacco.

TO RECOVER AMBER DEPOSITS

For the purpose of recovering amber deposits from the sands on the west shore of Lake Cedar, Manitoba, J. Dix Rogers, of Toronto, has been granted a 21 year lease of about 235 acres. The lease is renewable for a further 21 years, and the lessee pays $1 an acre per annum and 5 per cent. royalty on the value of amber recovered. The lease also provides that $5,000 must be expended on operations during the twelve months.

Ontario's Mineral Wealth

By W. R. ROGERS*

A FACTOR of great importance in the industrial and economic life of any nation is a domestic supply of raw materials. In this respect the chemical and metallurgical industries of Ontario are fortunately situated, for practically all minerals with the notable exceptions of coal and tin are produced within the bounds of the Province. This will be noted in reference to the Ontario Department of Mines' advertising page in this Journal, where the mineral output of the Province for 1920 is given in tabular form.

Ontario with its 407,262 square miles of territory, 3⅓ times the size of the British Isles or nearly as large as the states of Texas and California combined, contains vast pre-Cambrian areas, as will be noted on reference to the accompanying geological sketch map of Ontario. The pre-Cambrian rocks of Ontario form the central part of the great pre-Cambrian shield of North America.

It is in the pre-Cambrian formation that the far-famed nickel-copper deposits of Sudbury occur, also the rich northern Ontario are well provided with railway facilities and hydro-electric power.

The rapid growth of Ontario's mineral industry will be noted from the following figures for five-year periods, since the establishment of a Provincial Bureau of Mines in 1891:—

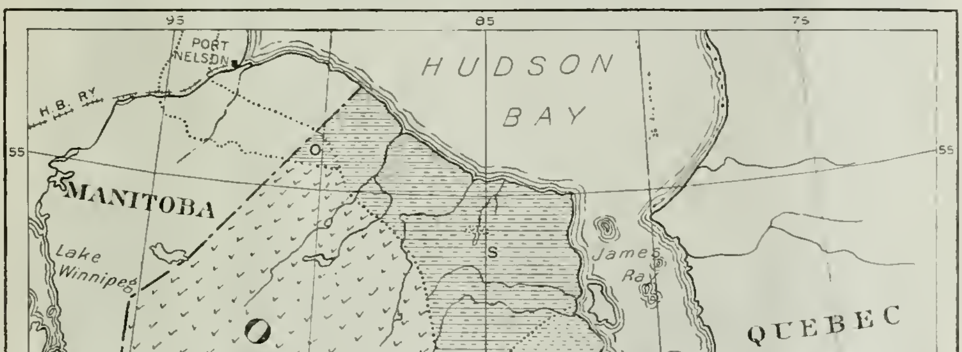
Year.	Value.	Year.	Value.
1891	$ 4,705,675	1906	$22,388,373
1896	5,235,000	1911	41,976,797
1901	11,831,086	1916	65,303,822

1918—War year of maximum production $80,308,972

1920—Preliminary production figures 68,456,781

The total value of the chief metals produced in Ontario up to the end of 1920 was approximately:—

Silver	$208,700,000	Gold	$73,000,000
Nickel	155,200,000	Copper	57,600,000
Pig Iron	82,300,000	Cobalt	8,500,000



Geological Sketch Map of Ontario.

silver veins of Cobalt, and the important gold ores of Porcupine and Kirkland Lake.

With few exceptions the producing mineral areas of

*Statistician, Ontario Dept. of Mines.

Nickel-Copper.

Ontario's position as the source of 80 per cent. of the world's nickel is well known. During the war the production of nickel and copper from the Sudbury field reached a

maximum, the 1918 production from 1,559,892 tons of ore smelted being 45,886 tons of nickel and 23,843 tons of copper. In that year, from the Creighton mine alone, over 1,000,000 tons of ore were raised. Smelters for the production of nickel-copper matte, situated at Copper Cliff, Coniston and Nickleton—all located near Sudbury—are operated by the International, Mond and British America Nickel companies, respectively. Monel metal, the natural nickel alloy produced by the International company direct from the matte, contains 67 per cent. nickel, 28 per cent. copper and 5 per cent. other metals. It is strong and non-rustible, also an acid, steam and salt-water resister. Post-war business in the nickel trade has been relatively small, but accumulated stocks are being absorbed gradually. Canada now has two refineries for the treatment of nickel-copper matte,—namely, that of the International Nickel Company of Canada, at Port Colborne, Ontario, which started operating July, 1918, and the newer electrolytic plant at Deschenes, near Ottawa. At the last-mentioned refinery, operated by the British America Nickel Corporation, gold, silver and metals of the platinum group are recovered. At the present time the smelters and refineries of these two companies are not being operated. Matte is shipped by the Mond company to its refinery at Clydach, in Wales.

Silver.

The Cobalt silver camp which has had a much longer life than most mining centres, is still producing at a creditable rate. Silver was first discovered in 1903 during the construction of the Temiskaming and Northern Ontario Railway. The year of maximum output was 1911, when 31,507,791 fine ounces were produced. Recent years have been marked by rapid strides in metallurgical practice. In the early days practically all the high-grade ore was shipped to the United States. Later, refineries were built in Southern Ontario at Thorold, Deloro and Welland, to treat the complex ores, which are cobalt-nickel-silver arsenides. These refineries turn out cobalt and nickel in metallic form, also as oxides and various other salts. White and grey arsenic are additional products. At Deloro a new insecticide plant has been erected. Ontario is the principal world producer of cobalt, the uses of which are rapidly expanding. At the present time a large proportion of the silver ore from Cobalt, Gowganda and South Lorrain is treated at Cobalt mills, and the silver product shipped in the form of bullion. Slimes and tailings are now being treated successfully by flotation and other methods. Low-grade ores carrying less than 10 ounces of silver to the ton are being treated at a profit.

Gold.

Prior to the discovery of Porcupine in 1909, gold mining in Ontario had never reached very large proportions, the maximum output for any year being $421,591 in 1899. Ontario possesses no placers, glacial action having scoured off all superficial deposits, and in many places a great thickness of rock as well. Gold mining was carried on under great handicaps during the war period, but to-day this branch of mining affords the most inviting field in Ontario. Canada's adverse position as regards exchange with the United States is really an asset to the gold mines, as they reap the exchange premium—gold being paid for in New York funds. In 1920 the premium amounted to approximately $1,376,275, or an average of nearly 12 per cent. on gold marketed.

Gold is now being produced in Ontario at the rate of $18,000,000 per annum. Owing to power shortage during the winter, production was curtailed. It is expected, however, that the total production for 1921 will approach $15,000,000, and probably exceed the output of California—the largest gold producing state in the American Union. In the Porcupine camp the Hollinger mine alone is treating 3,300 tons daily, of ore running about $10 per ton, or pro-

Hollinger Consolidated Gold Mine, Porcupine, Ontario.
Underground view showing character of ore body and diamond drill at work.

duction is at the rate of $12,000,000 annually. The Dome mine has found large bodies of high-grade ore in the lower levels—some very spectacular samples having been secured and exhibited at the Canadian National Exposition, Toronto, this year. Hollinger, Dome and McIntyre are the leading mines at Porcupine—the latter property is now installing additional milling equipment which will double the former capacity of 550 tons daily. Dividends paid by Porcupine mines to the end of 1921 totalled $18,802,166.

The Kirkland Lake gold area is rapidly gaining prominence. Tough-Oakes was the first producer, operating chiefly on narrow veins which led to an erroneous impression regarding the camp in general. To-day, the Kirkland Lake, Teck-Hughes, Lake Shore and Wright-Hargreaves are producing mines—the production for the first half of 1921 being $569,807, despite the handicap of power shortage for the first quarter of the year. The Lake Shore to date has paid $280,000 in dividends, and the Tough-Oakes $398,265. The last mentioend is resuming active operations. Lake Shore is producing at the rate of $600,000 per annum and is the highest grade producing gold mine in Canada to-day. Wright-Hargreaves leads in the output per man, which is approximately $25 per day of 24 hours for each employee.

Non-Metallic Minerals.

With such minerals as arsenic, corundum, feldspar, fluorspar, mica, graphite, gypsum, iron pyrites, salt and talc, Ontario is well supplied. Corundum, although displaced to some extent by carborundum, still fills a certain demand that the artificial product does not meet. Canadian feldspar is world famous, having a higher potash content than Norwegian or United States spar. A graphite vein, 70 ft. wide and 125 ft. deep, near Calabogie, in eastern Ontario, belonging to the Black Donald Graphite Company, is the largest and richest vein on the American continent. Southwestern Ontario is underlain by salt beds, brine being pumped from wells to supply the requirements of the different salt works. The Canadian Salt Company, at Sandwich, and Brunner, Mond Canada, Limited, at Amherstburg, both operate chemical plants on the Canadian side of the Detroit river for the production from brine of caustic soda and bleaching powder by the first mentioned, and soda ash by the latter. An extensive quarry of pure limestone or "process" stone is operated by the Brunner, Mond Company, at Amherstburg. The Henderson talc mine at Madoc in eastern Ontario is the largest high-grade deposit so far discovered in North America. Crude petroleum from Petrolia, although not great in quantity, has been produced for upwards of fifty years. Natural gas supplies the domestic needs of the population of southwestern Ontario, and legislative enactments have been made with the object of conserving the supply.

Structural Materials.

Ontario is well provided with all varieties of structural materials. Limestone, shale and clay for lime, brick, tile and cement manufacture are found in abundance. Building and monumental stone, sand, gravel, etc., are widely distributed. Magnificent ornamental marble in a great variety of colorings is quarried at Bancroft. High-grade fire clay has been discovered on the Mattagami river, 50 miles north of the Canadian National Railway.

J. J. Warren, president of the Consolidated Mining and Smelting Company, has returned from a trip to the Orient, where he went in the company's interest.

SYNOPSIS OF PRESENT SITUATION IN PRODUCTION OF CANADIAN INDUSTRIAL MINERALS.

(Continued from August Issue.)

Manganese.

The shutting off of Russian Manganese opened up the development of new sources, but Canada was not in a good position to take any advantage of the situation. Brazilian and East Indian ores were better than anything produced in New Brunswick or Nova Scotia, although it is doubtful if these properties received the full investigation warranted by the situation. The manganese ore in Eastern Canada has been worked in a small way at different times, but not for steel making. British Columbia seems more likely to produce manganese in future than any other province. Occurrences near Kelso and on Vancouver Island have been worked and the ore shipped to the States has been reported on very favorably. Ferro manganese is not produced in Canada, although the electric furnace method of manufacture is more desirable than blast furnace procedure. It should be a future industry of British Columbia.

Molybdenum.

Molybdenum had quite a boom in Canada during the war. Canada was the world's largest producer in 1917. Shipping 1,554 tons of concentrates, Canada has large quantities of low-grade ores, and if a demand for molybdenum ever comes, the sources in the country would be most valuable. The industry is centred at Quyon, Que., although deposits are known over a fairly wide area in both Ontario and Quebec. At present the industry is quite dead, but should revive in a small way, at least under normal business conditions, and if the cycle of industries were completed so as to manufacture molybdenum alloys and chemicals, it might well develop in fair proportions when exchange difficulties are better.

Nickel.

Nickel production is down again to a condition very similar to that existing before the war. New uses of nickel cannot quite keep up to the ability of Canadian companies to supply the demand. When pressed the nickel companies in the Sudbury district produced enormous amounts. Canada now has two very large refineries, one at Port Colborne and the other near Ottawa. The Mond Nickel Co., who are reported to have the largest recovery of platinum from their ores have a refinery at Clydoch, Wales. The greatest year in nickel was 1918, when 92,507,293 pounds were produced, valued at something slightly better than thirty-seven million dollars. Production was better in 1920 than 1919, amounting to about fifteen million dollars. Probably less than one quarter of the matter produced is as yet refined in Canada, but with the operation of the Ottawa refinery this will be increased. 1920 production was 61,136,493 pounds, with an average value of 40 cents per pound.

Oil Shales.

The oil shale question continues to receive regular attention and those financially interested desire the Government to allow special machinery for this industry to be imported free of duty. The Albert shales of New Brunswick are of the first importance and detailed specifications for plants have been recorded. The development of the industry in Scotland has seemed to be rather detrimental than otherwise, for operation elsewhere. The conditions are hardly the same here and the industry should be considered from a quite different economic

viewpoint. New Brunswick shales are high in oil and sulphate of ammonia generally speaking.

Platinum.

The situation with regard to platinum in Canada is rather interesting. Almost without knowing it or having anything to show, Canada has been the third most important source of this metal in the world. While never competing with Russia and Columbia, a considerable amount of platinum has come from the copper matte of the Sudbury nickel refineries. The naturally occurring compound of the metal is called sperrylite. This has been recovered outside of Canada for the most part. The only real attempt to develop a platinum business was begun by the Imperial Munitions Board. They found that the Tulamun River, B.C., would yield considerable amounts if operated in a large way. It was shown that a dredging average of 500,000 cubic yards per month should give 1,000 ounces of gold and 1,000 ounces of platinum. Nothing followed this survey.

Phosphate (apatite).

Phosphate rock suitable for fertilizer manufacture has not been located in Canada as extensively as might be desired. There are known deposits in Ontario and Quebec which are of very good composition, but are difficult to recover in an economic manner. The last word has not been said on the subject, however, and it may be that lack of a market has retarded development. Canada has a phosphorus industry at Buckingham, Que., and an outlet for good rock at Trenton, Ont.

Pyrites.

Ontario, Quebec and British Columbia are producers of pyrites. In Ontario the largest mines are at Gondreau, on the Algoma Central Railway, and at North Pines, on the Canadian National. Other good deposits have been worked in Central Ontario. In Quebec, production comes from the Eustis and Weedon properties in the Eastern Townships, while the Sullivan mine at Kimberley and the Hidden Creek Mine at Anyox supply British Columbia. At the present time there is no export business in pyrites, although the business did run over $900,000 during 1918 and 1919.

Potash.

The production of potash by any process from any source has not yet shown profitable peace basis development. The best natural source discovered is probably at Malagosh, Nova Scotia. Here the salt runs a few per cent. potash in certain layers. As this deposit is developed for its sodium chloride content, it may be possible to concentrate a certain amount of potash salt of fertilizer grade.

Salt (Na Cl).

Besides the well-known salt deposits of South Western Ontario and the chemical industries dependent upon them, the opening up of new deposits on the sea coast at Malagosh, Nova Scotia, are of some importance. Western Canada has not yet found a supply of this material, although they have natural salts of other acids.

Silver.

The price of silver is hardly enough to sustain production in the new districts. Cobalt has been declining and no new developments have come up which would warrant a large expenditure of capital. Ontario and British Columbia produce silver. With a better price and the same cost the industry would flourish and production increase, or with lower costs developments would be stimulated. Nothing short of very rich ore discoveries would boom the industry at the moment, although general conditions are said to be improving in operating mines. Canada has shipped over twenty million ounces per annum, and will always be a producer of silver in a fairly large way, as relatively good mines await transportation development.

Sulphates—Natural Sodium and Magnesium.

These industries missed the war boom and have had some difficulty starting up on a falling market. There seems no doubt remaining but that very valuable economic deposits of sodium salts exist in Alberta and Saskatchewan lakes, and a peculiar deposit of pure magnesium sulphate at Basque, B.C. Freight rates, lack of capital, and a certain amount of poor management due to lack of knowledge on the part of owners, are the chief handicaps. The result will be, however, that Canada can be counted on as a producer in these lines and possibly in a large way. The deposit of very high grade magnesium sulphate is unique on this continent.

Zinc.

Previous to 1916 refined zinc was not made in Canada to any extent. The electrolytic refinery at Trail, B.C., has placed this metal on a new basis. In fact, British Columbia produces most of the lead-zinc ores, with Quebec a very poor second. Zinc ore production has declined since 1918, when 63,006,464 pounds of zinc were shipped. In that year 12,574 tons were produced by refineries. The reported production during 1920 amounted to 40,166,200 pounds of which 18,517 tons of refined metal are credited to the Trail plant.

NEW CREOSOTING PLANT AT SUDBURY.

There are now some half dozen plants in Canada for impregnating timbers and ties with tars. The movement is toward treating all railway ties in this way and the annual consumption in Canada alone is 15,000,000 ties. The export business has further possibilities, particularly untreated timber. The original plant of Canada Creosoting Company is at Trenton, Ontario, where the business was established in 1911. Over 100 plants operate in the United States.

The new Sudbury plant of the C.P.R. opened August 1st with a capacity of 15,000 per day. Canadian tar production can be assisted by this expansion as a single tree may use from two and a half to three gallons of creosote oil.

The Sudbury plant is of brick and steel construction and is rated as the most up-to-date plant of this kind yet built in America. The two retorts are 150 feet long and 7 feet in diameter with a capacity of 5,000 cu. ft. of wood. It will carry a pressure of 225 pounds to the square inch.

The creosote enters from storage tanks above, and temperature is regulated by steam coils in the bottom. A temperature of about 200°F. is held. By placing ties in creosote under pressure and vacuum as well as by passing ties through presses which slash them to a slight depth, impregnation is secured. The pressure used varies from 100 to 180 pounds. The ties are left on metal cars during the process of treatment. The process is controlled and consideration given to penetration for various woods.

Dr. W. H. Collins, director of the Canadian Geological Survey, is paying a visit to the principal mining centres in British Columbia. He is being accompanied over part of the ground by W. Fleet Robertson, provincial mineralogist.

Chemical Engineering in England

The Development of Co-operation and Standardization in Production

THE fact that the Chemical Engineering Group of the Society of Chemical Industry has three representatives in America studying progress in the design of equipment and good practice in our industries, is worthy of some attention. Manufacturers in England are determined that their equipment must be brought up to the highest degree of efficiency known, and kept there. Labor conditions demand it and the opportunity is now at its best. The representatives in America are C. S. Garland, E. A. Alliott and Capt. C. J. Goodwin. Following the war the movement was initiated by Prof. J. W. Hinchly of the Imperial College of Science, London. The first meeting was held in July, 1918, when the general objects of the group were set forth as follows:

1. To advance the cause of Applied Chemical Science.
2. To raise the professional standard among Chemical Engineers.
3. To co-operate with educational institutions for the provision of suitable training for the men who are to enter the profession of Chemical Engineering.
4. To encourage original work in Chemical Engineering.
5. To collect and distribute such classified knowledge in Chemical Engineering as shall increase the efficiency and development of industrial activity.

By the end of 1919 some 500 members were secured and among them, those in charge of the manufacture of equipment in the largest firms in England. The papers already presented before these engineers have been the best produced in England on chemical engineering topics. The whole movement has met with startling success and should result in a good expansion of business for the firms who are going into the question of chemical equipment so thoroughly. A volume of proceedings to the end of 1919 is now available, and something quite equivalent to the work of the Institute of Chemical Engineers in the United States is well under way.

The photographs of three prominent members of this

MR. C. S. GARLAND, M.Sc.

CAPT. C. J. GOODWIN, B.Sc.

Mr. Garland is chiefly known through his connection with Thorium, as he has been associated with this material ever since graduation. In 1917, while Secretary of the Incandescent Mantle Manufacturers, he purchased the German works of the Clay Ring Company, and formed the first company to manufacture Thorium Nitrate in Great Britain. In 1920, he joined Nobel Industries Limited and formed their lighting branch known as "Lighting Trades Limited," which include the Ramie Company, Volker Lighting Corporation, Curtis & Harvey, Thorium Limited, British Thorium Syndicate, Clay Ring Company, Limited, W. A. Ward & Co., Limited, and Hopkins & Williams (Travancore).

Capt. Goodwin is a graduate of the Central Technical College of London University. During the war he performed valuable services for the Government in connection with explosives and at the present time is engaged in consulting practice with Oscar Guttmann & Sons, which firm was founded by his father. He is a Corporate Member of the Institution of Civil Engineers and is associated with the foundation of the Chemical Industry Club, of which he is Honorary Treasurer. He is an active member of the Engineering group of the Society of Chemical Industry and is also well known in the chemical trade paper field, being associated with the advisory editorial staff of a leading trade publication.

group are given, and we trust that they find in America a responsive attitude as a fair exchange of scientific ideas has yet to do business any harm. From the Canadian viewpoint, manufacturers will welcome a degree of new life on the part of English furnishers of equipment.

From the personal side the executive committee of this group has been well chosen, as it contains the names of leaders in the chemical engineering profession in England. These men have come through a war service which left them with a new experience and ambition, which when directed towards reconstruction work must show results.

The general office of these associated engineers is 24 Buckingham St., Strand, London, with H. Talbot, Hon.-Secretary in charge.

The French chemical industry, which has been stagnant for some time, shows signs of revival in such departments as are not connected with agriculture.

E. A. ALLIOTT, ESQ., B.Sc., A.M.I.M.E., A.M.Inst.C.E.

Mr. Alliott is a member of the Committee, and one of the founders of the Chemical Engineering Group—a recent off-shoot of the Society of Chemical Industry—and the first of a series of "Subject Groups," the formation of which exemplifies the future process of probable development of the Society. Mr. Alliott has a distinguished college record and extensive engineering training and experience, and is managing director of the well known English firm of Chemical Engineers (Manlove, Alliott & Co. of Nottingham). He has made an exhaustive study of many chemical engineering processes, e.g., "Filtration," "Drying," "Evaporation," etc., and his monographs on these and other subjects represent the latest discoveries and developments in the most modern English practice. He combines in an unusual degree the various qualities that go to make the successful chemical engineer, and is in private life a most modest and unassuming gentleman, and a most interesting conversationalist.

Chemical Society News

TRANSPORTATION TO NEW YORK FOR THE MEETINGS OF THE SOCIETY OF CHEMICAL INDUSTRY, THE AMERICAN CHEMICAL SOCIETY AND THE NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES.

Canadian members of the Society of Chemical Industry or of the American Chemical Society going to New York for the meetings and the Chemical Exposition may secure advantage of reduced rates granted by the railroads of the United States. The arrangement is that the fare will be upon the certificate plan which is in effect a charge of a fare (one way) and a half. For members in Canada this reduced fare will be applicable upon the purchase of tickets immediately upon arriving in the first city in the States across the border and will not apply to the Canadian portion of the fare. The tickets will be sold and can be used for passage upon the going portion of the ticket from September 6th and can be secured upon presentation of the Identification Certificate which will be supplied to members of these societies. As soon as members reach New York they should deposit their certificates at the Registration Desk in order that the return coupon may be validated. Members should do this even if they do not expect to return via the same route since their certificates apply upon the required quota. The return certificate is valid to reach the original starting point in the United States by midnight of September 23rd.

Certificates upon which tickets may be secured can be had upon application to C. R. Hazen, Chairman, Montreal Section; S.C.I., 84 St. Antoine Street, Montreal, Ont., or to Allen Rogers, Secretary, S.C.I., Pratt Institute, Brooklyn, New York, or to C. L. Parsons, Secretary, American Chemical Society, 1709 G. Street, N. W. Washington, D.C.

The Trunk Line Association, the Southeastern Passenger Association, the Central Passenger Association, the Western Passenger Association have all granted the special fare and the New England Passenger Association authorizes the special fare from the following points: Rouse's Point, N.Y., Burlington, Essex Jct., and Rutland, Vermont, via Troy. No other New England points or roads are granting this special fare and the Trans-Continental Passenger Association will not grant special fares upon the certificate plan from the Pacific Coast because tourist fares at the same rates are already in effect.

PERSONAL.

Mr. C. E. MacDonald, well known to the metallurgical industries of Canada as sales manager of the International Nickel Company of Canada, has resigned from that position and is now the Canadian representative for the Electrical Alloy Company, Morristown, New Jersey, manufacturers of resistance wire and other electrical alloys for various applications, especially electrical heating devices. Probably the chief product of this company is their "Karma" resistance wire, a pure nickel-chromium resistance wire. Mr. MacDonald is highly qualified for his new position, being one of the best known metallurgical engineers in the Dominion. He is a member of the Canadian Institute of Mining and Metallurgy and of the Engineering Institute of Canada.

What the New York Chemical Exposition Means

A Review of Types of Exhibits, Arranged for Those Who Go and Those Who Do Not. The Exposition in a Nutshell.

TO reduce to a relatively short space any account of the exhibits of some four hundred companies is a large task. We might say that real visitors who are something more than floor walkers, do not attempt to study exhibits beyond those in which they are particularly interested. The United States has much that is new to show the world in ideas on chemical equipment, machinery and developed products. The fact that distinguished foreign visitors will be present to examine this progress, puts America on her toes to show them what has been accomplished.

Canada will be represented this year by a large Government exhibit showing mineral and chemical resources of each province. The Water Powers Branch of the Department of the Interior as well as the Chemical Division of the Department of Statistics, will be represented. The Canadian Pacific Railway will be among those present with one of the best exhibits at the show, and several Canadian technical and engineering papers do their bit in the general work of directing enquirers to sources of information on Canada. The Canadian section is doing good work for Canada at the Exposition.

Because of the important convocations that are to be held in New York City during the week preceding the show, it is certain that more thon 50,000 chemists will be in the metropolis for the exposition. There is hardly any doubt but that those who come for the convention will stay over for the show, for there is no place like a big exposition to renew old acquaintances and make new friends.

Features of the Seventh National Exposition will be first the fact that all exhibits will be on one floor, and second that it will be the first time a suitable place for the symposiums and moving pictures has been secured. There is an auditorium in the armory that has been erected from theatre plans and the result is that there will be a stage giving adequate space for speakers and a screen, while the seating capacity of 1,400 is much greater than ever before. One of the drawbacks of the show in recent years has been the failure to secure proper accommodations for the hundreds who wanted to hear the scientific side of the industry discussed.

The list of exhibitors includes manufacturers who are handling things important to the daily life of the public. Some of the most important exhibitors will display as follows:—

Air Conditioning.

"Modern conditions make modern methods of Air Conditioning essential to successful manufacturing of many products; especially in textile manufacturing, and notably so in cotton manufacturing. Temperature, having such an intimate association with humidity, has also come in for its share of attention, and the modern Air Conditioning System is arranged wtih control not only for humidity, but also for heat."

Textile manufacturers know that from 8% to 15% of the normal weight of their product is due to the atmospheric content, and realize the importance of restoring the cloth to its normal condition after processes which apply heat. Cloth in its natural condition is improved in handle and appearance, and its weight and dimensions are increased.

Every material is affected by temperature and moisture which invariably reacts detrimentally to the finished product—as well as diminishing the efficiency of the worker. Manufacturers ever looking for the latest improvements in methods of controlling climatic conditions will find helpful information at the exposition. Candy and film manufacturers, paper and textile mills, printing and dye houses, baking trades and lumber dryers each have a problem to solve in this respect.

The results of scientific research by engineers practising the art of air conditioning will be a part of the exhibits.

A complete small size Merrill Process system as well as a High Duty Humidifier will be installed in one of the exhibits, where the splendid manufacturing results achieved in plants with humidifying systems under automatic control can be studied by those interested in improved manufacturing conditions.

The development of industries has led to a demand for the transmission and delivery of heat at unusual temperatures—as high as 600 degrees F. An oil heat transmission system will be exhibited which secures continuous operation under uniform conditions, a product of uniform reliable quality, reduced cost of manufacture, and increased production.

Any manufacturing process in fact, where air conditions, or drying practically determines the value in the finished product must meet these conditions in the most approved methods.

The exposition offers an unparalleled opportunity to study the latest inventions, improvements and complete equipment to meet these needs.

Dyes.

American manufacturers of dyestuffs supply more than 80 per cent. of the needs of this product in America. The American chemical and dyestuff industry is still in its infancy and to have been able in the few years it has been in existence to supply dyes that were made by concerns of more than 40 years of experience is an achievement that stands alone.

The Exposition of Chemical Industries will make every effort to stress the American dye situation. It is now a question of meeting the adverse propaganda which has been spread over the country, with proper information on the wonderful achievements of American dyes and their uses.

In 1915 there were but 7 dye concerns, while the 1919 census shows 227 making dyes.

It is at the chemical exposition that the newest achievements of chemical science make their first appearance. The exposition has always had the most complete exhibits of dyes ever assembled and when it comes to chemicals, they are all there. There will also be lamps for matching colors and testing their fading qualities. There will be water systems for providing neutral or chemicals to purify, soften or even to neutralize alkaline water and there will be exhibitors who will show the factory owner how to recover the valuable materials regularly wasted in sewage.

There is no problem from fuel value through the boiler plant to the washing and final recovery of values from

waste where some exhibitor cannot help the textile manufacturer or user of dyes.

Dust Arresters.

In the modern efficient factory dust is no small problem to be met by the up-to-date engineer. If one is to have greater production it is through employees and machinery that you will get it and the injurious dust that hampers their efforts, the grinding grit that wears out gears and bearings, minimizes power and production.

However, the perfect dust arrester does not only collect dust to eliminate its injurious effect on employees and machinery, and grave danger of dust explosions, but for its value as a salable product.

There will be installed at the exposition a dust collection and air separation equipment which has found a wide field in the cement industry, grain elevators, and such processes which involve the collection of fine dry dust.

There will be shown an air-separation system applied direct to the pulverizing mill which removes the powdered material from the grinding chamber as fast as pulverization takes place.

However peculiar your dust collecting problem may be there is a type for your purpose in as many units as your need requires. In this modern age of waste-elimination, by-products and complete efficiency, the dust collector is an invention of vast importance and worthy of careful investigation.

Storage Economy.

In these days of high costs of both materials and labor, the practice of economy is exceptionally important not only in producing efficiency in the manufacturing department, but in the handling of the raw materials and the finished products in warehouses and stock rooms.

In a two reel motion picture, "Saving Wasted Millions," this question and its solution will be forcibly depicted, covering as it will, the handling of materials, portable elevators and racks in the manufacturing plant, standard equipment and its adaptability to various conditions, piling of heavy containers and materials beyond the reach of men, attaching overhead motors, installing line-shafting and repair work, the saving of space in storing parts, cutting down time and man power, loading cars to capacity, added storage space, reduction of labor in storing, accessibility of stored material and cleanliness and order—sheer muscle power versus practical scientific engineering.

Industry is learning the way to handle storage with the fullest use of space and the most efficient application of labor. This exhibit of storage economy will no doubt hold the attention of every manufacturer or industrial expert eager to overcome the inefficiency of former years or to improve on conditions with the latest inventions.

Whether the problem in handling newsprint, piling flat cases, pulp or cotton, stoves or hardware, storing boxes, bales, crates or other forms of packages, loading cars or installing overhead motors, it will be answered at the show.

Containers—Shipping.

The question of containers is a most important one in the mind of the up-to-date manufacturer. How to best ship one's product in the safest, cleanest and least expensive way is a subject of increasing interest.

This important phase of the manufacturing and shipping of goods will be completely covered at the exposition by numerous companies which have made intensive study of the various needs in barrels, kegs, and other containers from crepe paper bags for linings for wood barrels or shipping powders in bags, seal perfect, to steel barrels, glass bottles and drums. Fibre folding cases, corrugated and folding cases, fibre rolled and glued barrels, wood barrels, will all be among the interesting exhibits.

A new device in this line which is expected to attract the interest of shippers is a fibre barrel of remarkably light weight but absolutely moisture proof and of surprising strength.

In connection with these exhibits a machine will be shown which labels bottles, packages and boxes as they come from the filling machine, a remarkable aid to efficient shipping.

Balances and Weights.

Perhaps no exhibit is of more interest to the chemist than the latest perfections of analytical and laboratory balances. Among the tools and measurements of precision will be a specific gravity chainomatic balance where all weighings or determinations are accomplished by placing the weight in the proper notch on the beam and final reading to the third or fourth decimal place, obtained by adding weight to the beam by means of the chain.

A complete line of accurate, sensitive and most carefully constructed balances, weights and measures that science has made possible in the last few years will be displayed for the benefit of scientists, druggists, chemists, and those trades and industries where accurate weight and measurement is essential.

Glass and Porcelain.

Glass, and its chemical and industrial relations, will occupy a remarkable display covering a wide range of optical measuring instruments, photo-micrographic apparatus, photographic lenses, microscopes, projection apparatus, (balopticons), ophtalmic lenses and instruments, range finders and gun sights, searchlight reflectors, stereoprism binoculars, magnifiers, cups and cylinders.

A complete exhibit of glass enameled iron and steel equipment, small laboratory utensils, stills, evaporating dishes, condensors, cascade dishes, vacuum pans, autoclaves, tilting kettles will also occupy space, where reduction of costs and improving operations will be explained by experts.

Chemical and scientific porcelains for laboratory uses will hold a place of importance. Special stress is laid on heat resistance in these wares. Crucibles which do not crack or become unfit for use after several heats are of great interest to the chemist or scientific experimenter.

Dishes made from a glass composition which is entirely unaffected by nitric, sulphuric and hydrochloric acids, regardless of temperature or concentration and offers great resistance to the action of phosphoric acid; casseroles perfected to meet the requirements of chemical and steam baths, will be a part of this comprehensive display.

Refrigerating Apparatus.

The question of refrigerating apparatus is not confined to the professional man interested in quick chemical reactions. Hotels, dairy farms, markets and cold storage plants, in fact any industry or activity which requires the refrigeration of air for whatever purpose will find a wealth of information in the exhibits along this line at the exposition.

The kind of heat employed, the distance of piping or cables, and the type of plant all must be considered in the installation of refrigerating machinery. But be it meat market, restaurant, hotel, ice cream factory, dairy,

store or any of the other myriad users of such methods, apartment house, candy factory, hospital, delicatessen all will find abundant information and opportunity to study the advantages of such machinery and profit by the experiences of others at the exposition.

Industrial Gas Masks.

A company furnishing safety apparatus to mines and such industries will exhibit gas masks as applied to industry, these appliances having been perfected for industrial uses and made more efficient.

Fire-Fighting Equipment.

Fire-fighting equipment has passed through various stages since the hand pump systems, culminating in the modern motor apparatus which will form an important part of the exhibits of the Exposition.

The up-to-date manufacturer has long-since found that fire-fighting preparedness is as important an adjunct to his factory installations as the latest labor-saving device.

The opportunity to discuss the ways in which others have overcome fire-dangers, and met emergencies will prove of invaluable aid not only to the factory owner, but to officials who are responsible for the safety of those living in factory towns as well. "An ounce of prevention is worth a ton of ashes."

Fire-fighting equipment, accessories and supplies will form an interesting display at the exposition, including safety signs, respirators, respirator masks and hoods, pure air supply apparatus, first aid equipment and supplies, fireproofed clothing and safety portable lights. In fact a full line of necessary equipment and appliances for first aid to the injured which in large industrial organizations has become a most necessary part of the plant.

Mining Machinery—Pumps.

There will be among the exhibits of special interest to the chemist a strictly acid-proof pump which is suitable for handling all corrosive liquids. The pump is of the open-impeller, side-suction type, except in cases where the service makes it desirable to use an impeller of chemical stoneware, in which case it is of the "double shrouded" or closed type. The pump is made for belt drive with out-board bearing, or with extended base for direct connection to motor through a flexible coupling.

Water carrying various percentages of sulphuric acid or cyanide solution must frequently be used in ore concentrating and coal washing plants, in case of the latter, because sufficient pure water is not available. A suitable pump for circulating this water economically and in large quantities, that will withstand the action of these aciduous waters, has been one of the problems connected with the operation of such plants.

Jigging Machines.

A modern washing plant for the cleaning of coal for fuel is a comparatively simple apparatus. Time was, when such a plant was a bewilderment of elevators, sprockets, chains, small capacity jigs, etc. Now it is an orderly affair, with few pieces of equipment and these of such capacity, durability and automatic regulation that the operator no longer is justified in regarding a coal-washing plant as a night mare.

At the Chemical Exposition will be found types to cover the whole range of requirements, from a simple Slack Jig for a small operation, to the preparation of coal for metallurgical coke.

Heating Water.

There are three principal reasons for preheating the water which is fed to a steam boiler—to increase the economy of the boiler, to increase the capacity of the boiler, and to increase the life of the boiler.

There will be exhibited for investigation at the exposition the latest improvements in systems of boiler feed water heating, where a saving of heat may be effected, while carrying an increased load without additional boilers.

To the engineer, architect, or superintendent who is considering the installation of a heater, the exposition offers a remarkable opportunity to study the various designs and improvements in such apparatus and compare their possibilities in meeting each particular need.

In localities where the water contains large quantities of mud or scale-forming impurities the demand for an instantaneous heater which can be easily cleaned has made itself felt. There will be on exhibit a heater built to meet these demands which may be easily cleaned through a construction giving access to the ends of the tubes without breaking any pipe joints.

Storage heaters, water-heating systems for steam laundries, the utilization of waste steam in dairies, pre-heating systems for beer de-alcoholization and other heating problems will be covered.

Metals.

To the user of minerals the exposition offers exceptional possibilities for actual investigation, study, technical information and advice, whether it be a new alloy or the more precious metals.

Mining of ore has brought to light many new minerals some of which must be understood to produce the best results. There is, for instance an alloy discovered as late as 1905. The average brass foundryman after finding out that the metal had a fair percentage of copper, decided that it ought to be a simple proposition and proceeded to cast in the same manner as he would cast brass. As a matter of fact it is difficult to cast. It is much more sensitive to oxidation, has a higher shrinkage, and demands a much larger percentage of metal in the gates and risers. It must be kept carefully covered and must be deoxidized before pouring. These difficulties are gradually being overcome, through the education of the foundrymen, especially through a plant service station where foundrymen can go for advice and information, where they may familiarize themselves with the use of the metal.

This particular metal is non-corrodible, strong as steel, tough and ductile. It can be machined, forged, soldered, and welded, both electrically and by the oxy-acetyline process.

There are many cases where ignorance of the best methods to employ in working with individual alloys or minerals with peculiar properties has prevented the best results or advantages to be obtained with these metals.

There will be a splendid exhibit of minerals, metals and alloys at the exposition, where the highest knowledge and experience of the chemical world will be at the command of any investigator.

Zinc and Its Products.

The rapidly increasing demand for Zinc Oxide as a paint pigment, and its value as an ingredient in protective coatings are subjects to which students of paint problems are at present devoting a great deal of attention. These may well visit the Chemical Exposition with its splendid opportunities for considering the properties and qualities of pigments, and scientific blending.

Says an exhibitor, "To devise and put together a product which will retain its appearance and provide the maximum of protection over the longest possible period

of time under such conditions of surface, application, exposure and climate as may be imposed on it, is a problem which taxes alike the maker of a paint and one who applies it. In practically all cases, those who make judicious use of zinc oxide come out winners in the race over those who do not."

The zinc exhibit will interest others, however, beside the paint trade. A very interesting work is being done in conjunction with finely divided zinc in its manufacture used as a catalytic agent in dye and explosive manufacturing and other chemicals as it is also employed in coating other metals by spraying rather than dipping, as in the old galvanizing process. In certain other trades, where zinc coatings are used, zinc dust for separating lead and cadmium in the production of pure zinc liquors that in turn are used for manufacturing lithopone, electrolytic zinc, zinc sulphate crystals, etc., the architect and building contractor will find in the exposition an opportunity to study the possibilities of various metals for their own particular uses, with the beneficial advice and suggestions of experts in charge of these different booths.

Precious and Rare Metals.

Platinum within the last few years has engaged the interest of both commercial manufacturer and chemist. Platinum, pure or alloyed, in sponge form and sheet and wire, of various sizes, shapes or degrees of hardness is in use in a variety of industries to-day both necessary and luxurious.

The exhibits of these uses of this precious metal in sponge wire, sheet and plate metal form, for use in electrical contracts, for catalytic processes, tooth pins, rivets, plate and foil for artificial tooth manufacturers, dentists and dental supply houses, for stylographic pen makers, jewelers, diamond setters, platers and colorers, surgical, physical and chemical apparatus makers; tubing, collars and rings, palladium vacuum regulators for X-Ray tubes will form one of the most interesting displays of the exposition.

No less important are other metals which will hold a place of interest to many visitors—selenium, tellunium, silver, gold, copper, and other rare metals and rare metal paints.

In conjunction with these exhibits there will be a most interesting film showing the extraction of radium.

Filters.

In the approved methods of to-day efficiency in every branch of factory or plant is demanded. In filters, the advantages looked for are labor saving, saving of filter cloths, perfect filtration, low cost of maintenance, perfectly clear filtrate, clean installation, high capacities, low moisture content.

All of these requirements have been met by exhibitors of filters at the exposition. An open tank filter which requires only one man operation in hundreds of square feet of filter area will be one of the exhibits.

A rotary continuous suction filter, superior for handling mud from hot, caustic solutions from continuous causticizing and lime recovery is a typical American product.

Large sums are spent annually by manufacturers experimenting with the clarity and keeping quality of their products. The opportunities for research and investigation at the exposition will be invaluable in obtaining filtering efficiency.

Filter Papers.

Filter papers, made by chemists for chemists, which will meet the most exacting demands of accurate analysis will be exhibited by manufacturers whose long experience has produced an article of undisputed merit and excellence.

Tests are urged and experimentation where the ability of these special laboratory supplies to meet the most particular requirements may be proved.

Water Softeners.

The shortcomings of natural water supplies are well known to practically all industries, institutions, individuals, and municipalities. Modern sanitation demands the filtration and sterilization of water to make it clear and free from disease-producing bacterial life. Economical business and domestic life demands that other so-called impurities such as hardness, iron, manganese, acids, sulphur, etc., be removed, so that low cost production of high grade materials or service be made possible.

Among the exhibits covering this important subject will be a model equipment which has been constructed at great expense in exact duplication of the very large commercial equipment manufactured by a company long experienced in water rectification and general sanitation. It is made accurately to scale, about four feet long, and all the small valves and piping are made to operate exactly as they do on the large installations.

A complete line of apparatus such as softeners, filters, iron and manganese removal equipment, etc., may be studied in detail. These bear special interest to laundries, seeking the means of producing sweet-smelling, white soft wash at minimum washing costs, textile mills manufacturing silks, worsteds, woolens and cotton goods, since soaking, degumming, bleaching, scouring, dyeing, finishing, etc., is carried on without destruction or waste of mill supplies. Hospitals, hotels, office buildings and institutions needing "soft water" bathing, shampooing, shaving and cooking, canning and food packing where water containing no lime and magnesia, no iron or manganese, no causticity or acidity, no dirt or color means much to the canner; chemical and drug manufacturer where uniform basic manufacturing conditions must be maintained; power plants operating turbines can obtain a scale-free water for the sealing glands; others operating oil, gas, or other internal combustion engines, have available in this apparatus a never-failing source of clear, non-scaling water for cooling purposes; artificial ice plants whether of the distilled or raw water types for feeding boiler or to eliminate the slimy deposit left by melting "hard water" ice; paper mills, which can ill afford to dodge its water problem by reason of the tremendous quantities of water it uses; furnaces and water-jacketed equipment; metal plating; garages; municipal water supplies or for the home—all these water problems are solved at the exposition.

Pumps and Condensers.

Air pumps and condensers have not been overlooked at the exposition this year. A most comprehensive exhibit has been planned. One company will display besides a double effect evaporator with circulating pumps and piping, a barometric ejector condenser, a centrifugal pump, Edwards air pump, and two steam jet air pumps, a model cooling tower tube exhibit.

Pumps for air, industrial gas, or acid gas will be exhibited. A pump or compressor where no valves, gears, pistons, piston packing, sliding vanes or interior lubrication is necessary will be entered in one of the displays on this subject. Tank pumping installations, pumping systems, vacuum apparatus for all chemical purposes, dry vacuum, centrifugal, air compressors, acid, and hydraulic pressure pumps and deep well engines will be shown.

Hard rubber pumps, pipe, fittings, tanks and utensils will form part of this most complete exhibition.

Rosin Oils and Pitch.

Many manufacturers are familiar with rosin oil and pine pitch while others know little about these products. Both will find much of value and interest in the exhibits of these gum distillations at the exposition.

Naturally the largest use for rosin oil is in the manufacture of greases, different trades requiring varying grades of the product. To the manufacturer or user of printing ink oils, belt oils, rubber manufacturers' supplies, insulating oils and compounds, varnish and paint oils, oil cloth and linoleum oils, brewers' oils, disinfectant oils, pitch or druggist supplies, there will be samples of all lines and grades for investigation and comparison, meeting every need of industry or specialties made up for individual requirements.

Wood Tanks.

An unusually comprehensive exhibit will cover the uses of wood tanks for every purpose. Many users are not at all familiar with what is required as a test for wooden tanks in the chemical industry, and in addition to the general exhibit there will be shown, by elaborate laboratory tests, the most suitable lumber to be used for the various acid solutions, which should be of considerable interest.

These laboratory tests consist principally of subjecting the various kinds of wood to solutions of both mineral and organic acids, caustic and other alkaline solutions, chemical salts, etc., in various concentrations and at different temperatures. Solvents, alcohol, oils, etc., will also be employed to determine the effect both chemical and physical on these different woods. In addition, various acid-proof paints, pitches and asphaltic materials will be tested to determine their resistivity to these various solutions. These tests are now under way and it is expected they will be completed within the very near future.

Paints.

One of the most interesting sections of the wood tank exhibit will be a display of acid-proof paints, pitches and asphaltic materials which will be tested to determine their resistivity to the various solutions contained in wooden tanks by manufacturers in the chemical industry. These tests are now under way and it is expected they will be completed soon.

Dryers.

The services of expert drying engineers from experimental drying laboratories will be at the disposal of any interested visitor. The discussion of all problems in connection with satisfaction and economy in drying products is urged by all exhibitors.

Exhibits on this subject will include a one man machine that dries any material capable of being sprayed, in three seconds, and to pass practically any mesh desired without scorching or burning, a vacuum chamber dryer which dries sensitive materials which are subject to reaction, oxidation, discoloration, etc., at a high temperature, without any of these changes taking place, vacuum drum dryers so constructed that every part is readily accessible enabling the dryer to be kept sanitary at all times, in fact every phase and condition of drying systems will be covered designed to eliminate all excess of consumption of steam, grinding costs, time, labor, and floor space.

Something new will be displayed in the nature of an evaporator, which will be featured by one exhibitor. This evaporator has been developed by long experience in the evaporator field. The heating tubes are neither horizontal nor vertical. They are installed in an angle position and are staggered. Steam enters the top chamber on left hand and descends through the tube toward the right. Any condensation formed falls to the bottom and goes out the pipe provided for this purpose. The steam which is not condensed rises and again descends through the tubes toward the left. This incline of the tubes very materially increases the flow of the steam through the unit and consequently gives a very large capacity per square foot of heating surface. Well directed and very violent circulation of the liquid being evaporated is one of the features of the machine, while a large expanding chamber above the heating surface has been provided.

How to turn waste liquors from a variety of chemical industries and convert noxious waste elements into a dry, compact, odorless and frequently valuable by-product is one of the interesting subjects which will be discussed. In fact the exposition offers the technical and engineering service of the most experienced chemical engineers to visitors seeking a solution to such problems.

Ovens.

The field of industrial ovens is one about which little has been published, yet of vast importance to the industrial world. The problem of oven applications will be thoroughly covered at the exposition, endeavoring to point out clearly in the various exhibits how industrial baking processes may be handled to the best advantage, securing economy of heat, fuel, labor, floor space, and increased safety of output, all of which are so vital in every branch of American industry.

In properly considering his oven problems, whether for cores, or japanning, etc., the modern oven engineer, or production manager must consider the floor space available and its possibilities of arrangement; the entrance and exit of work; the kind of work; the required care of handling; the weight and quantity of production; the points from which the work must come, and to which it must go after baking; the possible methods of handling and of reducing that necessary and scarce commodity—labor.

These various factors, each of such vital importance to efficiency and perfection of baking, are fully covered in the exhibits on this subject. Personal investigation and consideration is the one best way of selecting the proper installations.

Moisture Tester.

There will be, among the instruments of precision, apparatus for testing heat, density and air conditions, a moisture tester of special interest to the grain dealer, the flour mill or any allied industry where an accurate, reliable and rapid method for determining the moisture in any cereal or cereal product is necessary.

Chemistry has since the beginning of time worked its natural reactions on nature's products. It is for the inventive mind of modern man to use these great chemical reactions for material and industrial purposes. At the exposition there will be a vast array of apparatus and machines which aid the present-day manufacturer to better his product and make its manufacturing a simpler process.

For the mill or grain dealer to have absolute control over the moisture in all of the products that they buy or sell, without sending a sample to a chemical laboratory for the exact moisture determination, adds appreciably to the efficiency of its functioning. Tested and standardized

equipment creative of greater accuracy and efficiency will be found in the many exhibits of the exposition this year.

Clay Products.

There will be an interesting display of clay goods set up in a most attractive manner which will attract all those concerned in using clay products for building or otherwise.

According to an exhibitor, "with the developments made during the past few years in the manufacture of high-grade acid-proof chemical stoneware there is no further reason why the handling of corrosive solutions and gases should present any greater or more difficult problem than the handling of less active materials."

Storage vessels up to 850 gallons capacity are successfully made in one solid piece. The selection and preparation of clays, designs of making models and moulds, and fabrication of shapes and forms, combine with the drying and burning in making a perfect product in acid and heat resisting materials, which will successfully meet operations involving extreme and sudden changes of temperature.

The exhibits under this head are the result of years of experience and chemical skill which the visitor to the chemical show has placed before him for investigation.

Hammer Welding, Oil Stills, and Piping.

Engineers and draftsmen possessing expert knowledge of the most advanced practices and design of piping systems have contributed to the present accomplishments in this field.

An exhibit of great importance to engineers who have come to recognize that the problem of power plant piping is a vital and highly important element in the design of the plant will be that of a company whose complete power plant piping service includes the furnishing and installation of steam piping, complete with valves and fittings of the most approved type, connected up to the necessary headers—starting at the boilers and ending with the throttle valves on the machinery to which the power is to be supplied—whether low or high pressure.

The supplying and installing the necessary water and exhaust piping to and from the condenser plant and to and from such auxiliary equipment as boiler feed pumps, fire pumps, water supply pumps, and feed-water heaters and that of the prime movers, are also subjects which will be covered.

The efficiency, the economy and the continuous satisfactory performance of the plant are largely dependent upon the installation of the right sort of power plant piping.

The exposition will cover this subject inclusively, exhibiting systems of piping to meet varied demands.

Rubber, it has been found, possesses some very remarkable properties which are becoming widely appreciated in the chemical industry. Hard rubber pumps, pipe and fittings, tanks, and utensils which include buckets, measures, dippers, funnels, jars, syringes, spatulas, baskets, scoops, etc., will be exhibited,

A subject which attracts the interest of all chemists is that of the closed vessel on which heat and pressure is brought to bear. Many chemical reactions are accompanied by the giving off of noxious, inflammable or explosive vapors which must be restrained within the vessel itself.

Welding is one of the most important processes in the fashioning of these air-tight containers. This subject will be carefully covered in exhibits of improved methods and great completeness, where various styles of caulking, joining and welding may be studied.

Furnace Cement.

The most improved compositions now on the market in the line of furnace cements will attract the attention of manufacturers and engineers seeking a high temperature resisting material. The problem of a cement for Soaking Pits, Malleable Furnaces and Cupolas, heating and forging furnaces, has received special attention.

A highly refractory cement for lining and patching cupolas, cupola spouts, ladles, pit furnaces, making rammed-in linings, and special tile has been compounded for bonding firebrick in linings, walls and baffles, for bonding ganister for patches, for use as a coating or wash to give a hard and smooth lining in furnaces as a protection against abrasion.

Where one seeks a composition which will withstand intense temperatures without cracking, warping, peeling, blistering or opening at the joints, the exhibits of these materials will prove most helpful.

Automatic Controllers for Temperature, Pressure, Time, Levels, Etc.

Time, experience and invention have brouht about greater possibilities in scientific controlling of temperature, pressure, time, levels, and those conditions which must be kept accurate for perfect manufacture.

There will be shown at the exposition this year an important development in automatic regulation of dry kiln conditions of temperature and humidity, a controller which automatically controls a given temperature rise and humidity fall. This device regulates the valves on a heating coil and a spray so that the humidity is gradually decreased at the same time as the temperature is increased. Easy adjustments enable almost any desired temperature-humidity schedule to be duplicated.

Automatic controllers of temperature, pressure, vacuum, time, liquid-level and condensation discharge, assure uniformity in processes, save time, require no attention and reduce steam consumption.

The best methods for checking up on steam lines, trapping and untrapping, will receive attention. Coal today is so high that every shovelful counts.

There will be the latest improvements in thermometers, showing a marked step forward in temperature recording. To the manufacturer, chemist, or industrial engineer who requires a perfect control of air conditions the exposition offers unusual advantages in its exhibits of perfected instruments.

A new efficiency device which will be exhibited for the special attention of efficiency engineers in power plant and manufacturing departments, is a time punch for recording thermometers. This time punch makes a small hole in the time border of the chart the very second the button is pressed, making the recording thermometer for which it has been devised a time clock as well as a heat-recording apparatus.

Liquid measurement systems, meters recording steam flow, air flow, and flue gas temperature on the same chart, recorders built for hard, continuous work in any boiler room, convenient and accurate means of measuring tank contents, gauges which may be installed on the wall in the office giving perpetual inventory and a check on fuel oil or other liquid involced and consumed, the coutrolling of temperatures in powder magazines, all will be subjects discussed and on exhibit.

Official Programme of New York Chemical Exposition

MONDAY, SEPT. 12TH.

2.00 p.m.—Exposition opens.

7.00 p.m.—Motion Pictures (in Auditorium).

1. "Iron Mining Operations" (4 reels), (Courtesy U. S. B. M.).
   (a) Stripping; (b) Exploration and Stripping; (c) Underground Mining; (d) Logging Operations.
2. "The Jewels of Industry" (8 reels), (Courtesy the Carborundum Co.).
   (a) Creating Power from Water; (b) Within the Power Plant at Niagara; (c) In and About the City of Niagara Falls; (d) Power at Work in the Carborundum Plant; (e) Making the Crystal Masses in the Electric Furnace; (f) and Making them into Stones, Grinding Wheels, Paper and Cloth; (g) Unusual and Usual Uses for Abrasives in Some Fifty Industries.

8.00 p.m.—Opening Address.

Hon. Irvine L. Lenroot, U.S. Senate—An Address.

General Amos A. Fries, Chief Chemical Warfare Service—An Address.

TUESDAY, SEPT. 13th.

2.30 p.m.—Crushing, Grinding and Pulverizing Symposium.

Chairman—Harry J. Wolf; H. F. Kleinfeldt, Abbe Engineering Co. "Ball and Pebble Milling for Pulverizing and Mixing."

S. B. Kanowitz, Raymond Bros. Impact Pulverizer Co. "Grinding and Pulverizing with Air Separation."

L. H. Sturtevant, Sturtevant Mill Co. "Crushing, Storing and Pulverizing.'

M. I. Dorfan, Allis-Chalmers Mfg. Co. "Dust Collection as Applied to Grinding and Pulverizing Problems."

H. Schifflin, Allis-Chalmers Mfg. Co. "The Development of Compound Grinding Mills."

G. W. Repetti (The Dorr Co.) "Mechanical Handling of Finely Ground Wet Material."

Industrial Problems—

H. Austin, Ernest Scott & Co. "Solvent Extraction of Edible Fats and Oils."

R. H. McLain, General Electric Co. "Materials Handling in Industrial Plants."

W. H. Dickerson, Industrial Waste Products Co. "Utilization of Industrial Waste: Its Economic Importance."

(To be followed by motion pictures upon the subject of the "Handling of Materials," if time permits. See the first six titles upon this evening's program.)

7.00 p.m.—Motion Pictures.

1. "Use of the Steam Shovel in Mining" (1 reel). Courtesy U.S.B.M.
2. "Transportation and Storage of Iron Ore" (1 reel). Courtesy U.S.B.M.
3. "Transporting and Handling Coal by Various Means" (1 reel). Courtesy U.S.B.M.
4. "Dredging Anthracite Coal" (1 reel). Courtesy U.S.B.M.
5. "Saving Wasted Millions through Material Handling Equipment" (2 reels). Courtesy Economy Engrg. Co.
6. "The Story of Sulphur" (2 reels). Courtesy Texas Gulf Sulphur Co.
7. "Mining and Extraction of Radium from Carnotite Ore" (2 reels). Courtesy U.S.B.M.
8. "Du Pont Dyes, Showing Their Manufacture" (2 reels). Courtesy Du Pont de Nemours & Co.
9. "Making Soap" (1 reel). Courtesy Baumer Films.
10. "Mine Explosion and Rescue" (1 reel). Courtesy U.S.B.M.

WEDNESDAY, SEPT. 14th.

2.30 p.m.—Evaporating and Drying Symposium.

Chairman—Wallace Savage; E. G. Rippel (Buffalo Foundry & Machine Co.)

A. E. Stacy, Jr. (Carrier Engineering Corp.). "The Relation of Atmospheric Conditions to Chemical Processes."

H. S. Landell (Proctor & Schwartz). "Drying and Drying Problems."

Max Donauer (Elyria Enameled Products Co.) "Special Problems for Enameled Evaporators."

Arthur B. Stonex (Hunter Dry Kiln Co.) "Drying with Moist Air."

A. W. Lissauer (W. L. Fleisher & Co. Inc.) "Drying as an Air Conditioning Problem."

J. D. Stein (Grinnell Co. Dryer Division). "Atmospheric Drying by Means of Compartment, Tunnel and Continuous Belt Conveyor Dryers with some Practical Applications."

W. H. Dickerson (Industrial Waste Products Co.) "Spray Drying."

H. Austin (Ernest Scott & Co.) "Evaporation."

Robert V. Cook (Chemical Equipment Co.) "A New Arrangement of Heating Tubes in Heat Exchange Apparatus."

J. S. Chen (J. P. Devine Co.) "Vacuum as Applied to Industry."

7.00 p.m.—Motion Pictures.

1. "The Manufacture of Dry Sausage" (2 reels). Courtesy Armour & Co.
2. "The Making of Oleomargarine" (1 reel). Courtesy Armour & Co.
3. "The Electric Heart—The Dry Cell" (1 reel). Courtesy Baumer Films.
4. "Canning Electricity—The Wet Cell" (1 reel). Courtesy Baumer Films.
5. "The Manufacture of Pyrex Glassware" (3 reels). Courtesy Corning Glass Co.
6. "The Manufacture of Portland Cement" (2 reels). Courtesy U.S.B.M.
7. "The Manufacture of Dynamite" (1 reel). Courtesy U.S.B.M.
8. "Exterminate the Mosquito" (1 reel). Courtesy U.S.B.M.

THURSDAY, SEPT. 15TH. PAINT AND VARNISH DAY.

2 00 p.m.—Paint and Varnish Symposium.

Chairman—R. S. Perry (Perry & Webster, Inc.). "Paint and Varnish Waste Control."

H. A. Gardiner (Institute of Paint and Varnish Research). "Reflection Factors on Industrial Paints."

L. P. Nemzek (DuPont de Nemours & Co.). "Laboratory Control."

Maximillian Toch (Toch Brothers). "Rust: Its Cause and Prevention."

Frank G. Breyer (New Jersey Zinc Co.). "Physical Testing of Paints and Paint Materials."

F. P. Ingalls (John W. Masury & Co.). "The Ideal Paint and Varnish Specification."

D. A. Kohr (Lowe Brothers Co.). "Limitations of Standardizations of Paint and Varnish Manufacture."

7.00 p.m.—Save the Surface; Paint and Varnish Speakers and Motion Pictures.

Ernest T. Trigg (Chairman, "Save the Surface" Com-

Note—"U.S.B.M." on this program refers to United States Bureau of Mines.

mittee, Paint Manufacturers Ass'n. of the U.S.).

"Save the Surface and You Save All with Paint and Varnish."

G. P. Heckel (Secretary Paint Manufacturers' Association of the U.S.). "What is Paint?"

To be followed by "Motion Pictures."

1. "Making White Lead" (2 reels). Courtesy Bureau of Commercial Economics and National Lead Co.

2. "Making of Varnish" (1 reel). Courtesy Bureau of Commercial Economics and Murphy Varnish Co.

3. "Making of Paint and Varnish" (2 reels). Courtesy Bureau of Commercial Economics and Sherwin-Williams Co.

4. "Making of Paint" (1 reel). Courtesy Bureau of Commercial Economics and Lowe Bros.

5. "Making of Paint" (1 reel). Courtesy Bureau of Commercial Economics and Matthews & Co.

6. "Making of Varnish" (1 reel). Courtesy Bureau of Commercial Economics and Taylor, Tregent & Co.

7. "The Manufacture of Pyrex Glassware" (3 reels). Courtesy Corning Glass Co.

8. "The Manufacture of Portland Cement" (2 reels). Courtesy U. S. B. M.

FRIDAY, SEPT. 16th.

2.30 p.m.—The Power Plant in the Chemical Industries Symposium.

Chairman—R. C. Beadle (Editor "Combustion").

R. M. Gordon (The Solvay Process Co.) "Modern Boiler House Arrangement and Equipment" (illustrated).

John Primrose (Power Specialty Co.) "Suggestions for Reducing Heat Losses in Chemical Plants."

E. G. Bashore (Rice & Bashore). "Boiler Feed Water Treatment and Treatment Control."

A. R. Stevenson, Jr. (General Electric Co.) "Compressed Air Installations in Industrial Plants."

D. B. Rushmore, J. A. Seede and E. Pragst (General Electric Co.) "The Application of Electric Power in Chemical Industry."

F. G. Anderson (Morse Chain Co.) "The Limitation of Silent Chain Drive."

D. S. Chamberlin (Distillation Industries, Inc.) "A New Method for Coking Coal as Required for Industrial Fuel."

H. D. Savage (Combustion Engineering Co.) "The Application of Pulverized Fuel."

Perry West (Anti-Corrosion Engineering Co.) "The Prevention of Internal Corrosion in Pipes, Tanks, and other Iron and Steel Equipment."

(To be followed by motion pictures upon "The Power Plant," if time permits. See the first four titles upon this evening's program.)

7.00 p.m.—Motion Pictures.

1. "The Cost of Careless Firing" (2 reels). Courtesy U.S.B.M.

2. "Getting the Most Out of Coal" (1 reel). Courtesy U.S.B.M.

3. "Conserving Coal and Saving Heat Values by Insulating Steam Pipes and Boilers" (1 reel). Courtesy Magnesia Assc. of America.

4. "Modern By-Product Coking" (2 reels). Courtesy The Koppers Co.

5. "The Story of Rock Drilling" (4 reels). Courtesy Sullivan Machy. Co. and U.S.B.M.

6. "The Story of Armco Ingot Iron" (3 reels). Courtesy American Rolling Mill Co.

SATURDAY, SEPT. 17TH.

2.30 p.m.—American Dyes: Chairman—Justin B. Weddell (National Aniline and Chemical Co.).

7.00 p.m.—Motion Pictures (subject to change).

1. "Zinc Mining, Milling and Smelting" (4 reels). Courtesy U.S.B.M.

2. "Manufacture of Zinc Oxide" (1 reel). Courtesy U.S.B.M.

3. "Making DuPont Dyes" (2 reels). Courtesy DuPont de Nemours Co.

4. "Manufacture of Dynamite" (1 reel). Courtesy U.S.B.M.

5. "Mining Magnetic Iron Ore" (2 reels). Courtesy U.S.B.M.

INDUSTRIAL NOTES.

Oil Cracking Industry Proposed.—The Mona Petroleum Products, Ltd., a new incorporation in Canada, have secured the right to use the "Trotter Process," for cracking kerosene and producing lighter oils, gasoline, petroleum, ether, etc. The company states that they have secured land at New Toronto and will go ahead with the erection of plant. The first unit will treat kerosene only, but it is planned to handle crude oil eventually.

Under suitable catalytic conditions, the kerosene is broken up in suspension under steam jets at 1100°F. The results have been shown by Dr. Trotter to give a most excellent commercial yield of lower volatile oils, which as motor fuel give a high efficiency.

The successful starting of such a work will mean an important addition to Canadian oil refining industries.

New Fertilizer Plant for B.C.—The Triangle Chemical Company are arranging with the city of New Westminster, B.C., for a lease of all the waterfront comprised in the Indian reserve on the North Arm. It is the intention of this firm to erect a plant for manufacturing muriatic acid, sulphuric acid, superphosphate and a full line of chemical fertilizers.

Fisk Chocolate Co.—A company, known as the Fisk Chocolate Co., Ltd., has been organized, with head office at Toronto, Ont., to manufacture and deal in a general chocolate, candy and confectionery business. Capital stock, $50,000.

New Oxygen Plant.—The Dominion Oxygen Company, Limited, is starting this month on the construction of a $250,000 plant in Montreal, which will be substantially a duplicate of the company's Toronto plant. The new unit will double the production capacity of this organization. Hitherto the company has supplied oxygen to consumers through five district distributing stations. The Montreal plant will be the second of five producing plants projected at the time the company was organized last year.

Beaver Board Curtails Operations.—The board manufacturing department of the Beaver Board Company, at Thorold, Ont., has been closed to allow the demand to catch up to the stock on hand. The roofing department of the Thorold plant is, however, working at full capacity.

Installs Another Electric Furnace.—The Empire Brass Manufacturing Co., Ltd., London, Ont., has recently installed a second Bailey Electric Furnace, rated at 195 K.W. with a hearth capacity of 1,500-2,000 lbs.

The Dominion Foundries and Steel, Limited, Hamilton, Ontario, have installed a new universal plate mill at a cost of $1,500,000.

The Duluth interests, mentioned in our June issue as having purchased the Atikokan Iron Company's blast furnace at Port Arthur, Ont., are the **Palatine Mining and Development Company**. Arrangements for railway service have been completed with the Canadian National Rail-

ways, whereby the Palatine Co. are to rebuild that portion of the P. A. D. & W. Railway between North Lake and Gunflint, and from Gunflint to the Paulson mine, in Cook county, Minnesota, and will operate it under a ten-year lease from the Canadian National. The Canadian National is to re-rail that portion of the P. A. D. & W. between its junction with the National's main line and North Lake. Work on the above lines is practically completed. The blast furnace plant will be enlarged and will have a daily capacity of 500 tons..

J. W. Cummings Co., New Glasgow, N.S., have installed an electric furnace of a capacity of 1½ tons, which will be used for making steel castings. This company has built up a large business in miners' tools.

The new **De Lavand Centrifugal Process** for making cast iron pipe by centrifugal force is proving very successful at the plant of the National Iron Corporation, Toronto. Mr. Gordon Perry, president and general manager of the National Iron Corporation, is also a director of the International De Lavand Manufacturing Corporation, a company organized to control the patents for the De Lavand process.

An important industry may be developed at **Calgary, Alberta,** in the manufacturing of oil drilling tools. Recently five strings of these tools, manufactured in Calgary for the Imperial Oil Company, were shipped to the MacKenzie River field for development work. These strings are worth over $15,000 each.

Sinclair, Valentine and Hoops, Ltd., printing and lithographing ink manufacturers, Toronto, have opened a new department for the manufacture of dry colors, with Mr. J. A. Ridgway, late of T. E. O'Reilly, Limited, in charge. The company have also opened a wholesale chemical department and will transact a general chemical business under the direction of Mr. Ridgway.

BORAX AND POTASH AGENCY.

The Imperial Trading Company, Montreal, of which Mr. G. E. Peterson is Manager, announces that they have taken up the agency for the whole of Canada for Borax and Muriate of Potash as produced by the American Trona Corporation. This corporation went into the potash business in a large way during and since the war, and are the largest manufacturers of American potash.

American potash is now being shipped guaranteed to contain less than 1 per cent. borax, and it is reported often to be better than this. The purity of Potassium Chloride is guaranteed at 92% K Cl and large quantities are now available at 96% to 98% K Cl.

This company states that they have succeeded in raising the grade of American borax several per cent. and are in a position to ship the highest quality of product for Canadian consumption. It is of value to the trade to note this new source of borax and the improvement in potash. For some time borax was a cause of worry in certain grades of American potash, but that condition seems now to be entirely overcome.

It is certainly interesting to know that in these articles American companies are in a position to compete for business in Canada in spite of obvious international exchange values greatly to their disadvantage.

BRITISH COLUMBIA INDUSTRIAL NOTES.

The Whalen Pulp and Paper Company has restarted its plant at Wood Fibre, B.C. This plant manufactures only high-grade pulp suitable for book-paper. There was a falling off in demand for this kind of pulp in the early part of the season, and the plant was closed. Conditions now have improved, resulting in the reopening of the plant, which employs 300 men. The Whalen company's plants, manufacturing pulp for newsprint, have been running at capacity, and turning out nearly 2,000 tons of pulp weekly.

The Triangle Chemical Company has been organized in Vancouver for the purpose of manufacturing hydrochloric and sulphuric acids, super-phosphates and other fertilizers. The company has made arrangements with the city of New Westminster for a lease of all the water front on the northwest arm, where it proposes to erect its plant.

CATALOGUES RECEIVED.

A New Canadian Link-Belt Book on Belt Conveyors.—A new book on Belt Conveyors has just been published by the Canadian Link-Belt Company of Toronto and Montreal. It is book No. 215. It fully describes the Uniroll and Multiroll Idlers recommended by this company.

Among the interesting features of the book are: 1. The correct methods of figuring Belt Conveyors and the details entering into them. 2. Price lists which will enable the user to determine the cost of a complete conveyor or any portion of a conveyor. 3. Numerous examples suggesting the correct types of Belt Conveyors for the handling of Bituminous Coal, By-Product Coke, Sand and Gravel, Bagged Sugar or similar material, Crushed Rock, etc. 4. In addition there are many illustrations of typical installations.

This book should be a valuable addition to any library, and will be sent by the Canadian Link-Belt Company to anyone interested in this subject.

CLASSIFIED ADVERTISEMENTS.

(See *also page* 62)

SCHOLARSHIPS OFFERED.

Chemical, Oil and Metal Markets

The quotations below represent manufactures' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

CHEMICALS.

Signs of improved conditions in the Chemical Market have increased during the past week, and spot orders have been much more frequent. It is now very apparent that buyers have more confidence in prices. Declines are getting down to a narrow margin and apply principally to out of season goods. Advances were infrequent, and under the circumstances higher prices would not be in order,

and throughout the whole trade the feeling was much better, and excellent business should result in the fall.

Heavy Chemicals.

The most noticeable declines are:—

Tartaric Acid	1c.
Silicate of Soda	5c.
Lead Acetate	1c.
Light Carbonate of Magnesia	1½c.
Epsom Salts	10c.
Lithopone	1c.
Zinc Oxide	½c.
Yellow Prussiate of Soda	1c.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals and Industrial Minerals.

Inorganic.

Alum, Ammonia, lump and ground	100 Lbs.	5.00— 6.50
Ammonium Bromide	Lb.	.. —.45½
Aluminium Sulphate, high grade, bags	100 Lbs.	.. — 4.00
Ammonia, Aqua 26	Lb.	.11— .12
Ammonium Carbonate	Lb.	.10— .20
Ammonium Chloride	Lb.	.08— .15
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .14
Barium Sulphate (Barytes)	Per Ton	30.00—35.00
Barium Chloride	Lb.	.05—.07½
Barium Nitrate	Lb.	.. — .20
Barium Peroxide	Lb.	.. — .20
Barium Sulphate, B.P.	Per Ton	100.00—110.00
Battery Acid, up to and including 1.400 sp. gr.	Cwt.	3.00— 3.50
Battery Acid, over 1.400, up to and including 1.835 sp. gr.	Cwt.	3.50— 4.00
Bleaching Powder, 35% drums	100 Lbs.	.04½— .05
Borax, crystals	Lb.	.. —.07¾
Boric Acid, powdered	Lb.	.. — .18
Bromine (technical)	Lb.	.. — .38
Calcium Carbide, car lots, f.o.b. works	Ton	.. —100.00
Calcium Carbide, ton lots, f.o.b. works	Ton	.. —105.00
Calcium Carbide, less than ton lots, f.o.b. works	Ton	.. —110.00
Caustic Soda, ground, drum	Cwt.	5.75— 6.25
Caustic Soda, solid, drum	Cwt.	5.00— 5.50
Calcium Chloride, fused	Per Ton	50.00—55.00
Camphor Monobromate	Lb.	.. — 3.00
Carbon Bisulphide, in drums	100 Lb.	.. — .10
Carbon tetrachloride, drums	Lb.	.18— .20
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	30.00—40.00
Cobalt Oxide, black	Lb.	.. — 2.50
Cobalt Oxide, grey	Lb.	.. — 2.80
Copperas (Iron Sulphate) crystals	Lb.	.02—.02¼
Copperas (Iron Sulphate) sugar	Lb.	.02—.02¼
Copper Sulphate (Blue Vitriol)	Lb.	.07½—.08½
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 1.45
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fuller's Earth, car lots, f.o.b. Toronto	Ton	35.00—40.00
Ferric Chloride, crystals	Lb.	.13—.14½
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid, 60%	Lb.	.. — .30
Hydrofluoric Acid, 30%	Lb.	.. — .14
Hydrochloric Acid, carboys, 18	100 Lbs.	2.75— 3.00
Hydrogen Peroxide	Gal.	.95— 1.00
Iodine, crude	Lb.	.. — 4.75
Iodine, resublimed	Lb.	.. — 5.20
Iron Oxide (red)	Lb.	.05— .13
Lead Acetate	Lb.	.16— .17
Lead Nitrate	Lb.	.16— .18
Lime, grey	Ton	.. —16.50
Lime, grey, in car lots	Ton	.. —14.00
Lime (hydrated) in ton lots	Ton	.. —23.25
Litharge	Lb.	.. — .10
Lithium Carbonate	Lb.	.. — 1.70
Lithopone	Lb.	.07— .08
Magnesite, calcined	Per Ton	25.00—30.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.13— .16
Magnesium Sulphate	Lb.	.03½—.04½
Mag. Sulphate, B.P., Medicinal...Single	Ton	70.00—75.00
Mag. Sulphate, Technical, car lots	Ton	65.00—60 00
Muriatic Acid, 18	100 Lb.	2.75— 3.00
Nickel Salt, single, in bbl. lots	Lb.	.. — .15
Nickel Salt, single, per cwt.	Lb.	.. —.16½
Nickel Salt, double, in bbl. lots	Lb.	.. — .15
Nickel Salt, double, per cwt.	Lb.	.. —.16½
Nitric Acid, 36 carboys	100 Lb.	.09—.09¼
Phosphoric Acid, 85%	Lb.	.43— .50
Phosphoric Acid, 50%	Lb.	.29— .31
Phosphorus, yellow	Lb.	.. — .44
Potash Prussiate yellow	Lb.	.28— .30
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.25—.32½
Potassium, Bromide, granular	Lb.	.25—.32½
Potassium Bichromate	Lb.	.. — .32
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — ..
Potassium Chlorate	Lb.	.. — .12
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash)	Sticks	.. — .80
Potassium Hydroxide (caustic potash) small drums	Lb.	.10— .15
Potassium Hydroxide (caustic potash) large drums	Lb.	.07—.08½
Potassium Iodide	Lb.	.. — 3.50
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.65— .70
Red Precipitate (Mercuric Oxide)	Lb.	.. — 2.50
Silver Nitrate	Lb.	.. —10.00
Soda Ash, bags	Cwt.	2.90— 3.00
Sodium Acetate, ton lots or over	Lb.	.. —.08½
Sodium Acetate, lesser amounts	Lb.	.. — .15
Sodium Benzoate	Lb.	.65— .80
Sodium Bicarbonate, 100% pure	100 Lb.	3.50— 3.75
Sodium, Bichromate, bbls.	Lb.	.12— .14
Sodium Bisulphite, powder	Lb.	.. —.09½
Sodium Bisulphite, 35	Lb.	.05½— .06
Sodium Bromide (foreign)	Lb.	.30— .35
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.. —.27½
Sodium Hyposulphite, kegs	100 Lb.	5.00— 5.75
Sodium Iodide	Lb.	.. — 4.00
Sodium Nitrate, refined	100 Lbs.	6.25— 7.25
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Peroxide, f.o.b. New York	Lb.	.38— .40
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	.. — 2.00
	Per Cwt. in Car Lots	.. — 1.75
Sodium Sulphite	Lb.	.. — .05
Sodium Prussiate, Yellow	Lb.	.13— .17
Sulphur, ground	100 Lb.	2.75— 3.50
Sulphur, roll	100 Lb.	4.50— 4.75
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.50— 3.00
Sulphuric Acid, 66 Be, tank cars		.. —24.00
Talc, No. 1 grade	Ton	.. —30.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	.. —18.00
Tin Chloride, crystals	Lb.	30 — .35
Tri-sodium Phosphate	Lb.	.. — .08
Ultramarine, Blue	Lb.	.15— .40
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting (English)	Ton	.. —35.00
Whiting (American)	Ton	.. —30.00
Whiting	Per Ton	35.00—40.00
Zinc Sulphate, com.	Lb.	.05¾—.06½
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.9½—.10½
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.. — .55
Acetic Acid, glacial, carboys, f.o.b. Shawinigan Falls	Lb.	.. —.22½
Acetic Acid, glacial, bbls., f.o.b. Shawinigan Falls	Lb.	.. — .22
Acetic Acid, 28%, carload lots	Lb.	.. —.04½
Acetic Acid, 28%, 25 bbl. lots	Lb.	.. —.05¼
Acetic Acid, 28%, 15 bbl. lots	Lb.	.. —.05½
Acetic Acid, 28%, 10 bbl. lots	Lb.	.. —.05¾
Acetic Acid, 28%, 5 bbl. lots	Cwt.	.. — 5.85
Acetic Acid, 28%, 3 or 4 bbl. lots	Cwt.	.. — 5.90
Acetic Acid 28%, 1 or 2 bbl. lots	Lb.	.. — .06
Acetic Acid, 80%, carload lots	Lb.	.. — .12
Acetic Acid, 80%, 25 bbl. lots	Lb.	.. — .14
Acetic Acid, 80%, 15 bbl. lots	Lb.	.. — .15
Acetic Acid, 80%, 10 bbl. lots	Lb.	.. —.15½
Acetic Acid, 80%, 5 bbl. lots	Lb.	.. — .16
Acetic Acid, 80%, 3 or 4 bbl. lots	Lb.	.. —.16½
Acetic Acid, 80%, 1 or 2 bbl. lots	Lb.	.. — .17
Acetone, pure, drums or over	Lb.	.. —.19½
Acetone, pure, lesser amounts	Lb.	.. — .25
Aspirin, in 100-lb. lots	Lb.	.90— 1.05
Alcohol, Absolute Ethyl, case of 1 doz 1-lb. bottle	1-lb. bottle	.. — 2.15
Alcohol, Absolute Ethyl, in steel drums of 10 gallons capacity	Imp. Gal.	.. —15.00
Alcohol, acetone, bbls. or over	Gal.	.. — 1.40
Alcohol, acetone, lesser amounts	Gal.	.. — 1.70
Alcohol, pure, bbl., 65% O.P.	Gal.	.. —10.50
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 1.15
Alcohol, wood, 95%, half bbl. lots	Gal.	.. — 1.25
Alcohol, wood, 95%, lesser amounts	Gal.	.. — 1.30
Alcohol, wood, 97%, bbls.	Gal.	.. — 1.78
Alcohol, wood, 97%, half bbl. lots.	Gal.	.. — 1.90
Alcohol, wood, 97%, lesser amounts	Gal.	.. — 2.05
Amyl acetate, technical	Gal.	4.75— 5.25
Amyl acetate, pure	Gal.	5.75— 6.25
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — .90
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 1.40
Camphor, refined, slabs	Lb.	.. — 1.15
Camphor, refined, tal	Lb.	.. — 1.22
Carbolic Acid, white crystals	Lb.	.67— .75
Chloroform	Lb.	.55— .60
Citric Acid, domestic, crystals	Lb.	.65— .70
Coumarin	Lb.	.. — 6.00
Cream Tartar, 98%	Lb.	.25— .30
Dextrine, potato	Lb.	.. — .09
Dextrine, corn	Lb.	.. — .09
Ether, B.P. conc.)	Lb.	.. — .63
Ether, Sulphuric	Lb.	.35— .50
Formaldehyde, bbls. or over	Lb.	.. —.21½
Formaldehyde, 200-lb. kegs	Lb.	.. —.26¾
Formaldehyde, 100-lb. kegs	Lb.	.. —.27¾
Formaldehyde, 50-lb. kegs	Lb.	.. —.28½
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Gallic Acid	Lb.	1.25— 1.75

Glycerine, C.P., single tin of 56 lbs.	Lb.	.. — .31
Glycerine, C.P., two or more tins	Lb.	.. — .29
Glycerine (pale straw) single tin 56 lbs.	Lb.	.. — .30
Glycerine (pale straw) two or more tins	Lb.	.. — .28
Iodine, resublimed	Lb.	.. — 5.20
Hexamethylenetetramine		1.10— 1.50
Oxalic Acid	Lb.	.19— .25
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.50
Phenolphthalein	Lb.	.. — 1.80
Pyrogallic Acid	Lb.	3.00— 3.50
Quinine	Oz.	1.00— 1.10
Saccharin	Lb.	3.50— 4.00
Salicylic Acid	Lb.	.. — .35
Starch, corn, ground, car lots	Lb.	.. —.04½
Starch, potato, ground, car lots	Lb.	.. —.07½
Stearic Acid, Double Pressed	Lb.	.15— .16
Stearic Acid, Triple Pressed	Lb.	.17— .18
Tartaric Acid, crystals or powdered	Lb.	.39— .44
Tannic Acid, commercial	Lb.	.45— .65

Rubber.

The following quotations on rubber are in American funds, New York delivery:

Crude.

Para, upriver	Lb.	.. —.17¼
Caucho Ball, upriver	Lb.	.. — .12

Plantation Rubber.

1st Latex Crepe	Lb.	.. —.18½
Smoked Sheet	Lb.	.. —.16½

Scrap Rubber.

Boots and shoes	Lb.	.04— .05
Automobile tires	Lb.	.. — .01
Steam and fire hose	Lb.	.. —.01¼
Inner tubes, No. 1	Lb.	.. — .08
Inner tubes, No. 2	Lb.	.. —.05¾

Tanning and Dyeing Materials

Fustic Crystals	Lb.	.28— .32
Hematine Crystals	Lb.	.20— .26
Logwood Crystals	Lb.	.20— .30
Quercitron Liquid Extract	Lb.	.06¾—.07½
Liquid Sumac Extract	Lb.	.07½—.08½
Ground Sumac	Ton	70.00—72.00
Chestnut Liquid Extract	Lb.	.02¾— .03
Hemlock Liquid Extract	Lb.	.04½—.04¾
Quebracho Liquid Extract	Lb.	.04—.04¼
Quebracho Solid Extract	Lb.	.05—.05½
Liquid Blended Extract (Canadian)	Lb.	.04—.04½

Metals.

Aluminium, No. 1, 98-99%	Lb.	.. — .29
Antimony	Lb.	.. —.07¾
Brass, yellow ingots	Lb.	.. — .14
Brass, red	Lb.	.. — .16
Cobalt, metal	Lb.	.. — 3.50
Copper, electrolytic, small lots	Cwt.	.. —16.75
Copper, electrolytic, car lots	Cwt	.. —16.25
Copper, casting, small lots	Cwt.	.. —15.75
Copper, casting, car lots	Cwt.	.. —15.25
Gold, Pure	Oz.	23.00—25.00
Iron, Pig	Ton	.. —43.00
Lead, pig, small lots	Cwt.	.. — 6.60
Lead, pig, car lots	Cwt.	.. — 6.10
Magnesium, ribbon	Oz.	.. — 1.50
Magnesium, ribbon,	Lb.	.. —18.00
Magnesium, powder	Lb.	3.00— 3.50
Mercury	Lb.	1.10— 1.25
Nickel, shot or ingot	Lb.	.. — .40
Platinum, pure	Oz.	85.00—90.00
Silver, bar, American silver	Oz.	.. —.99¼
Silver, bar, Canadian produced, U.S. funds	Oz.	—.58⅝
Steel, mild, ¼ inch, base price	Cwt.	.. — 5.75
Steel, mild, 3/16 inch, base price	Cwt.	.. — 6.25
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	8.15— 8.50
Tin	Lb.	.. — .37
Zinc, sheets	Lb.	.. — .20

Zinc (spelter) small lots	Cwt.	.. — 6.85
Zinc (spelter) car lots	Cwt.	.. — 6.35

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .31
Motor Gasoline (service stations)	Gal.	.. — .35
Lighting Gasoline	Gal.	.. — .38
Naphtha	Gal.	.. — .32
Coal Oil	Gal.	.. —.20½
Fuel Oil	Gal.	.. — .08
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 1.00
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 2.25
Crude Creosote Oil, bbls.	Gal.	.. — .40
Refined Creosote Oil, bbls.	Gal.	.. — .65
Crude Coal Tar	Bbl.	.. —10.25
Refined Coal Tar	Bbl.	.. —11.50
Coal Tar Pitch, bbls.	Cwt.	.. — 2.15
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52—. 57
Dip Oil, 20 per cent.	Gal.	.38— .44
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .10
Naphthalin Balls	Lb.	.. — .11
Alpha-Naphthylamin	Lb.	.. — .61

Flotation Oils and Naval Stores.

Rosin, Grade G, in 280 bbl. lots		.. — 9.00
Rosin, Grade W.W., in 280 bbl. lots		.. — 9.50
Turpentine, spirits, single bbls.	Imp. Gal.	.. — 1.07
Turpentine, spirits, 5 to 6-bbl. lots	Imp. Gal.	.. — 1.06
Turpentine, spirits, 5-gal. container	Imp. Gal.	.. — 1.22

Waxes, Gums, Vegetable and Essential Oils.

Essential Oils—

Cedar, leaf	Lb.	.. — 2.00
Cedar, wood	Lb.	.. — 1.15
Camphor	Gal.	.. — 6.75
Camphor, white	Lb.	.. — 1.00
Peppermint, American	Lb.	.. — 5.50
Peppermint, re-distilled, B.P.	Lb.	.. — 3.50
Peppermint, Japanese	Lb.	.. — 3.25

Vegetable Oils—

Anise Oil	Lb.	.70— 1.00
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .21
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .19
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.30— .32
Corn Oil, in bbls.	Lb.	.. — .10
Corn Oil, tank cars	Lb.	.. — .08
Cottonseed Oil, crude, f.o.b. Mississippi Valley points	Lb.	.. —.05¾
Cottonseed Oil, crude, f.o.b. Texas points	Lb.	.. —.05½
" Oil, summer yellow, f.o.b., Chicago	Lb.	.. — .07
" Oil, winter yellow, f.o.b. N.Y.	Lb.	.. — .08
Linseed Oil, raw, single bbls.	Imp. Gal.	.. — .97
Linseed Oil, raw, 3 to 5-bbl. lots	Imp. Gal.	.. — .96
Linseed Oil, raw, 6 to 9-bbl. lots	Imp. Gal.	.. — .94
Monopole Oil	Lb.	.. — .30
Olive Oil, foots, at Toronto	Lb.	.11½— .12

Gums—

Indian, No. 1A	Lb.	.. — .40
Indian, No. 1	Lb.	.. — .38
Tragacanth, No. 1, Ribbon	Lb.	.. — 4.50
Tragacanth, No. 1, Flake	Lb.	.. — 3.50
Tragacanth, Turkey	Lb.	.. — 3.75
Arabic, clear amber sorts	Lb.	.. — .18
Arabic, regular grain No. 4 and No. 6	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22¼
Arabic, white sorts	Lb.	.. — .40
Arabic, powdered, No. 1	Lb.	.. — .25
Arabic, powdered, No. 2	Lb.	.. — .24

Waxes—

Beeswax, various grades	Lb.	.39— .51
Paraffin, 128°—130°, M.P.	Lb.	.. — .22
Paraffin, 118°—120°, M.P.	Lb.	.. — .19
Paro Wax, blocks	Lb.	.. — .20
Shellac, T.N.	Lb.	.. — .84

Fertilizer Materials.

Acid Phosphate	Ton	.. —30.00
Animal Tankage, per unit of Ammonia		.. — 2.00
Animal Tankage, per unit of Bone Phosphate of lime		.. — .10
Nitrate of Soda	Ton	.. —75.00
Muriate of Potash	Ton	.. —76.00
Pure Ground Blood, per unit of Ammonia		.. — 2.25
Steamed Bone Meal	Per Ton	.. —45.00
Sulphate of Ammonia	Ton	.. —65.00

C. P. Chemicals.

Ammonia, C.P.	Lb.	.. — .27
Hydrochloric Acid, C.P.	Lb.	.. — .16
Nitric Acid, C.P.	Lb.	.. — .24
Sulphuric Acid, C.P.	Lb.	.. — .15

Industrial Gases.

Hydrogen (cylinders)	per 100 cu. ft.	1.00— 1.50
Oxygen (cylinders)	per 100 cu. ft.	1.40— 2.50

CANADIAN CHEMISTRY AND METALLURGY

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P. F. McCLEARY, Associate Editor. T. LINSEY CROSSLEY, Editor. L. E. WESTMAN, Business Manager.

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FROM THE PUBLISHERS

Our Place in Your Business.

Did it ever occur to you where chemistry as a business or a profession would be were it not for the various papers which print what Chemists have learned or are doing? Every time you read a good article or a given subject do you realize the great organization of chemical papers that makes this information service possible for you?

Each has its field, and ours happens to be Canada. Most of our readers are absolutely dependent on the progress of chemistry in Canada for their future. We are telling a monthly story about this progress, which supplements your personal knowledge of events.

We ask you: How much of what you learn for the first time about chemical events, scientific information, new equipment, business proposals, etc., did not first become common knowledge through chemical publications?

The production of this paper is a Canadian Chemical Industry as the product manufactured is of service to every Canadian Chemist, and is a leading factor in the all important work of bringing to your attention both progress and the possibilities of progress in a given line. In the matter of inviting others to assist in the development of Canadian resources, the circulation of this paper abroad is a most valuable aid.

Just as we send an individual copy of this paper to you, you must consider yourself partly responsible for individual strong or weak points. When you contribute something, whether it be trade or personal information, or a descriptive scientific article, you are making possible this whole fabric of service and information for chemists. While by doing this you are helping others, you are doing more for yourself.

If you are a sponge for information, give yourself a squeeze, the exercise will do you good.

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EDITORIALS

A NOTE OF PROGRESS

At most political conventions it is expected that in the opening address a "keynote" will be sounded or some slogan coined. Something similar has been the series of Inter-Anglican meetings which will make the autumn of 1921 epochal in British and American chemistry.

Sir William Pope in his presidential address (printed in full elsewhere in this number) struck what will perhaps be considered the keynote of that series of meetings, when he referred to the growing insistence of circumstances which will make it imperative that we obtain our food and fuel in greater measure from surplus energy derived from the sun.

The point that expensive technologists and laboratory methods cannot successfully compete with the free energy of the sun's rays and cheap labour should be of practical importance to Canada. Our agricultural and dairy development will tend to become more and more a matter of application on a large scale of facts ascertained in the laboratory. Many conditions which now are sources of loss or uncertainty could be controlled in some measure, as in the case at the University of Illinois where, as the result of some six or seven years' experimentation, it was found possible to produce two kinds of corn: one especially for fodder with low fat and high nitrogen, and another with high fat and low nitrogen for starch, oil, and glucose derivation.

Sir William's mention of the plantation rubber industry ought to bring to us a further realization of the fact that the technologists of Britain were not asleep in those twenty years before the War. They had seen visions and were busy harnessing nature to their fulfilment.

We are all faddy, and may cause somewhat of a list on the chemical ship by rushing from coal-tar synthesis to biochemical analysis, but we were not on an even keel anyhow, and the view is splendid.

THE NET RESULT

The vision of a few has been realized, and Anglo-Saxon chemists have met in Canada and the United States.

Representatives from the British Empire, South America, and other countries have come together at New York, in joint meetings, and the results, we confidently believe, will be most far-reaching. A common science is a natural meeting-place for everyone, and this, with a common language, will make strong friendships, provided the personal contact is frequent.

From the purely Canadian standpoint, the holding of the annual meeting of the Society of Chemical Industry here was the most important chemical event to date in our history. It is gratifying to feel that all sections lived up to what was anticipated from them, and the enthusiasm and publicity gained should go far to develop the future of the Society here.

The place of travel as a teacher is most clear. Business men, chemists, and everyone visiting Canada for the first time from England and the United States, are uniformly amazed by three things: the extent of our country, the development of our cities and towns, and the moderation of the climate. It is indeed a partial pleasure to see visitors from England and America wiping the perspiration from their brows, as they struggle with even September weather. We are personally convinced that the settlement of Canada has been retarded by generations, because of the false reports circulated about our weather conditions.

Canada may be considered as one of the few remaining desirable opportunities for Anglo-Saxon development on a large scale. Exhibits of our resources in other countries never fail to arouse enthusiasm, enquiry, and, eventually, the desire to come to our assistance in their future development.

The mingling of Canadian chemists with representatives of English and American industries results in concrete propositions for the development of Canadian business, and through these stages all developments must pass.

The net result of the series of meetings of chemical societies just closed will be the establishment of a firmer basis of understanding between American and English scientists, and the focusing of hundreds of new eyes on Canada as a country well worth keeping in mind in a business way.

AMERICAN MEETINGS

It is to be regretted that, through lack of space and the pressing urgency of reporting Canadian news, it is impossible for us to carry in this paper a detailed account of the stirring chemical meetings and events, which took place so recently in New York.

A meeting of the American Chemical Society has come to be in reality a gathering of several chemical societies. The sections of the Society are

many, and the papers presented are to be numbered by hundreds. The day has gone when a comfortable general interest in chemistry or science can be satisfied at such a gathering. Each paper is a highly specialized contribution, essentially of value to the few, in order that it may be of value at all. We do not wish to be understood as discounting the value of attendance at such meetings. We advise chemists to keep in close touch with the work of the section which covers their field.

The international aspect of the events cannot help but be broadening to everyone. The activities of the Society of Chemical Industry point to international possibilities of co-operation among chemists; and it is good, at all times, to foster this fellowship. The Chemical Exposition indicated the business conditions of the past year to a considerable extent. Most companies came, more as a matter of form, than otherwise, but were gratified by the interest taken, the enquiries received, and the apparent prospect of better times in the near future.

As an opportunity for Canada, the Chemical Exposition will always be important. A knowledge of our business and resources is transferred by contact with individuals in other countries, to an extent perhaps greater than we estimate. In spite of all modern means of communication, people still like to talk it over, and for this reason visitors from Canada at such times become salesmen for the Dominion.

The chemical industries of the United States, more particularly the dyestuff industries, are bringing every ounce of pressure possible on the Government to give them a measure of protection, sufficient to allow for their proper establishment. Whether or not they secure their entire demands, it is certain that the War has produced an American chemical industry, which bids fair in a short time to outstrip all previous developments. This transference of a certain balance of power in such matters to America will be reflected, no doubt, to some extent at least, in rapid Canadian developments and the utilization of Canadian resources.

PROGRESS IN CANADIAN CHEMICAL INDUSTRIES

THE Mining, Metallurgical and Chemical Branch of the Bureau of Statistics, Ottawa, is to be congratulated on their recent publication of a second Directory of Canadian Chemical Industries. This report, developed by a chemist, Mr. S. J. Cook, who is in charge of the branch, indicates what can be done when the Government employs the right man in the right place.

In spite of all the dark clouds, it must be considered hopeful that our exports in 1920 in chemical and allied products were over four times what they were in 1914, and 1921 does not appear to be much behind. They will be close to $20,000,000 even this year. Our imports have about doubled since 1914, and will run around $36,000,000 in 1921. This means that in a poor year, and one in which trade depression was felt, we were able to maintain a position far in advance of our best prewar record. During this year prices of chemicals have been reduced greatly, and it cannot be said that the increase in dollar value does not represent a considerable increase in tonnage.

Are even Canadians aware that there are eight hundred firms operating over one thousand plants whose products are either chemicals or the result of processes involving distinctly chemical reactions?

If the knowledge of the individual is a true indication of the conception of a people, there is much spade work to be done abroad in the interest of Canadian resources. British chemists and executives are amazed at what has been done here, and grasp quickly the possibilities for the future. The same is true for Americans who have Canada presented to them properly, and it is our business to assist the development of our home market in every possible way. It is a critical time and yet one which we should not fear, for if statistics are worth anything it would appear that progress even since the war has been considerable, and it is certain that conditions will improve as the purchasing power of the world in general recovers.

At the same time we trust that all Canadian chemists will study the statistics of their own country so that they may play their proper part in stimulating and bringing about industrial progress.

THE NAME "CHEMIST"

EACH year brings more complexity to the nomenclature of chemists. The industrial or academic chemist, as broadly understood, is a most unfortunate individual, in as much as he has no distinctive name. There are two broad ways, in which the chemist as we refer to him, may proceed. He may become an "engineer," using such modifying terms as will distinguish him from all other engineers. For example, he may become a "Registered Professional Engineer" from a legal standpoint, and a "Consulting Chemical Engineer," or "Analytical Chemist" for everyday use.

One other way out of the difficulty would be to sustain his claim to the word "chemist" and ask those who graduate from colleges of pharmacy to alter their nomenclature, or restrict it to one or more of their several other designations.

The only place where the word "Chemist" is defined in the Province of Ontario, as far as we

are aware, is under the Pharmacy Act. Quoting Section 286, Chap. 164, R.S.O. 1914, it is definitely stated that "No person shall assume or use the title of "Chemist and Druggist" or "Chemist" or "Druggist," or "Pharmacist" or "Apothecary" or "Dispensing Chemist," or "Dispensing Druggist," or any sign, title or advertisement, implying or calculated to lead the public to infer that he is registered under this Act, unless such person is registered under this Act, and has a certificate under Section 20, etc."

We are of the opinion that the "Druggists" of Ontario, if properly approached, would not be entirely against the suggestion that they might worry along with four of their present five legal names, leaving the word "Chemist" for that growing army of scientifically trained men who are concerned with branches of work having nothing to do with pharmacy.

History has done many strange things, and the science of chemistry is indebted in its early beginnings to the direct ancestors of the druggist; but this is the twentieth century, and the word "Chemist" in Canada at least, means more to others than it does to the druggist. It is true that students in pharmacy might discount a knowledge of chemistry, if they were not to be called "Chemists;" but, as a matter of fact, few of them make any claim to being chemists, in the modern sense of the term.

If, by any stroke of good fortune, a revision of Pharmacy Acts could be made, whereby the word "Chemist" could be handed over to graduates in Chemistry and properly trained industrial chemists, it would clear up the situation considerably, and might act as a brake to keep "Chemists" from running after engineering designations which are not absolutely desirable, everything considered.

The professional chemist has such a bright and distinctive future ahead of him that he should take more thought of this matter of a name; and we feel that some discussion of these suggestions would not be out of order.

Ask the "Druggists" in your town or city what they think about it.

COMPLEXITIES

NOT the least of the difficulties entailed upon the speakers at recent Chemical meetings was that of properly designating the group of chemists to whom they referred. The overseas visitors could not be described as Englishmen. They included or represented Scotch, Irish and Welsh. They could not be referred to as British without including the Canadians and other Imperial constituents. The pleasant folks who live next door could not be specifically referred to as Americans without properly including Canadians. We could not refer to the group as Anglo-Saxon without excluding some distinctly not of that derivation.

Doesn't it show how indissolubly we are united in a great commonwealth for good will?

COOPERATIVE SELLING OF CHEMICALS

AT a meeting of the recently organized Salesman's Association of the American Chemical Industries, Jack Jones, Sales Manager of the Alexander Hamilton Institute, in his address advocated a cooperative selling campaign, which would put the chemical industry "Over the Top" in the markets of the world. Nothing on a worth while, world-wide scale has ever been done without a strong organization, with a well-defined plan for a strong cohesion of units behind it.

Business is now on the up-grade, and before twelve months have passed, the country will be on a basis closely approaching normal. The chemical industry is the base on which the successful industrial organization of a nation depends, and the present problem is not to make it prominent nationally, but internationally.

Salesmen were urged to put their greatest efforts into such a plan, and to visualize the possibilities resulting from increased sales.

We are particularly interested in things Canadian. Are we big enough yet to have our producers of chemicals and salesmen get together for a little study of the markets they are trying to cover right here? It might be that they could cooperate to advantage, and improve business for themselves. All that is necessary in a matter of this kind is a good leader and we suggest that someone, who feels the call, gets busy.

NOTES ON THE MEETING

The Montreal committee came in for much commendation on the design and appearance of the lapel pin.

Just think of the potentialities of the trip to New York. At the next meeting in London, when a speaker makes a hit, several members will call out "Ataboy, you said a mouthful."

Who said Dr. Herty suggested that joint jamboree? Old Lake Ontario began to rehearse for it forty years ago.

At the Clifton Dr. McIntyre suggested a discussion as to whether it really was stormy on the lake. This was several hours afterwards, however.

With the external world revolving one way and your internal anatomy travelling the other direction how sweet it is to hear the immigration officer say that you cannot get a "landing card" without a passport, when said passport is in your trunk somewhere miles below.

Fortieth Annual Meeting of Society of Chemical Industry

Report of Montreal Convention---A Notable Event in Chemistry in Canada.

THE week of August 29th, 1921, will long be remembered as a red letter period in the history of chemical progress in Canada, for no other event as the fortieth annual meeting of the Society of Chemical Industry, which opened in Montreal on Monday, August 29th, had ever brought together on Canadian soil, such a large number of distinguished chemists, both academic and industrial.

For the first time in its history, the Society met in Canada, and also for the first time a Canadian, Dr. R. F. Ruttan, was elected to the presidency. This feature alone marked the meeting as the most important gathering of chemists ever held in the Dominion, but in addition to this, Canada, and particularly Canadian chemists, were honored with the presence at the meeting of many leaders in chemical science and industry, from Great Britain and the United States, including Sir William Pope, president of the Society; Dr. J. P. Longstaff, General Secretary; Dr. Edgar F. Smith, President of the American Chemical Society; Dr. William H. Nichols, Past President of the American Chemical Society and of the Society of Chemical Industry; Dr. Herty, Past President of the American Chemical Society and editor of "The Journal of Industrial and Engineering Chemistry"; and Dr. William A. Noyes, University of Illinois.

When the plans were first prepared for the holding of the Fortieth Annual Meeting in Canada, it was expected that there would be some two hundred delegates in attendance from Great Britain. Industrial conditions arising out of the critical post-war period in England, including particularly the disruption of the chemical and allied industries as a result of the great coal miners' strike, unfortunately prevented very many, who had hoped to come, from making the journey.

The following made up the overseas delegation to the meeting: W. G. Adams, Gas Light and Coke Co., London, England; Eustace Alliott, Director of Manlove Alliott & Co., London, Eng.; Dr. F. W. Atack, British Alizarine Co., Manchester, Eng.; Dr. J. T. Barber, The Central Laboratory Co., Ltd., Widners, Eng.; Keith Benham, Director, Universal Grinding Machine Co., Ltd., Stefford, Eng.; C. R. Craig, Director, Craig and Sons, Caldercruix, Scotland; Bernard Collitt, Sheaf Iron Works, Lincoln, Eng.; R. H. Clayton, Manager, the Oxide Co., Manchester, Eng.; Richard J. Fletcher, Chemical Manufacturer, North Geelong, Victoria, Australia; C. S. Garland, Allen and Hanburys, Ltd., London, Eng.; Dr. C. J. Goodwin, Oscar Goodwin and Sons, London, Eng.; W. Heaf, the Ranice Co., Bradbury, Eng.; E. Harlton-Brown, Consulting Chemist, London, Eng.; Dr Louis A. Jordon, London, Eng.; Peter Kerr, Shell-Mex, Ltd., Essex, Eng.; P. LeGood, Advertising Manager, Journal of the Society of Chemical Industry, London, Eng.; Dr. J. P. Longstaff, General Secretary, Society of Chemical Industry, London, Eng.; N. Lindberg, Chemical Engineer, Stockholm, Sweden; Professor James W. McBain, University of Bristol, Eng.; John A. McWilliam, St. John's College, Cambridge, Eng.; P. A. Maschowitz, Downing College, Cambridge, Eng.; Professor K. C. Pandya, Agra, India; Sir William Pope. James Reid, Craig & Sons, Paper Mills, Caldercruix, Scotland; and Professor Vergara Vargas, Bogota, South America. The laides in the overseas delegation included Mrs. J. T. Barber, Mrs. F. W. Gamble, Mrs. C. S. Garland, Miss Reid and Mrs. Vergara Vargas.

Canadian chemistry, both academical and industrial, was represented in large numbers, as may be learned from the complete list of registrations on page 298 of this issue.

From first to last the meeting was a decided success, and to the members of the Montreal section of the Society of Chemical Industry, great praise and credit must be given for the masterly manner in which they handled the convention while in session, and for the real genuine hard work that they expended in the making of the arrangements for the meeting. Those in charge of arrangements at points visited by the party also contributed much to the general entertainment of visiting guests while in Canada.

MONDAY, AUGUST 29th.

The sessions opened Monday morning, August 29th, at the Chemistry Building, McGill University, with the registration of members and guests. The registration cards showed 262 registrations. At 10 o'clock a meeting of the Council of the Society was held, Sir William Pope presiding, at which the regular routine reports were received. One hour later saw the members and guests seated in the large lecture room of the Chemistry Building for the first open session, with Mr. Theo. H. Wardleworth in the chair. The official welcome of the Province to the distinguished visiting chemists and members of the Society was royally extended by Sir Charles Fitzpatrick, Lieutenant-Governor of the Province of Quebec. Sir Charles said that he spoke not only for Quebec, but for the whole of Canada, and that very morning he had met the Rt. Hon. Arthur Meighen, Prime Minister of Canada, who had requested him to convey to the Society his welcome on behalf of Canada. Sir Charles referred to derogatory remarks made by President Gompers of the American Federation of Labor, relative to the tie binding Canada to the Mother Land, and advised President Gompers to read the British North America Act and learn what was the tie of Imperial Unity, the reality of which was shown by fifty thousand Canadian graves in Flanders and France.

Sir Charles pointed out the invaluable services that had been rendered the Empire by men of Science, not only in peace but in war, as was shown by the record of the society's president, Sir William Pope, while similar services had been rendered by the chemists of both the United States and Canada.

Proceeding in humorous vein, Sir Charles pointed out the difficulties that faced Canada, with more than half a continent, divided geographically into two parts, with two great races, "and then some more." Not only were farmers and workers needed to solve the Dominion's problems, but scientists. The Americans came here with their capital, and stayed on the job, looking after it. Unfortunately in the past, the British had been content to send their capital, and leave the people to look after it, with the result that frequently the people did look after it. (Laughter.)

In conclusion Sir Charles welcomed the members of the Society and their guests to McGill University, "an institution that is symbolical of the public spirit and munificence of the merchants of Montreal," a condition which he apparently thought was much superior to state-owned or controlled universities.

The Welcome of the Canadian Institute.

Professor J. Watson Bain, President of the Canadian Institute of Chemistry, in a few well-chosen remarks,

heartily welcomed, on behalf of the Institute, the members of the Society who were attending the meeting from Great Britain, the United States and all parts of Canada.

Sir William's Reply.

On behalf of the visiting delegation and the members generally, Sir William Pope replied to the words of welcome. The addresses just given, he stated, had simply expressed in words the overwhelming hospitality he and his colleagues had received since coming to Canada. When a year ago it had been decided to hold the annual meeting in Canada, it had originally been hoped that several hundred delegates would come to Canada. But labor and other disturbances had made it impossible for more than a score to attend. He was especially glad that the delegation included so many young men, since they would have the opportunity to study Canada's resources and to remember what they had seen, when, during the next quarter of a century they took their places among the officers of the Society. The formal welcomings being over, Mr. Wardleworth relinquished the chair to the President, Sir William Pope, who then gave his presidential address, which appears in full elsewhere in this issue.

Just prior to Sir William's address, the ballots for the election of officers were passed, and Dr. Johnston and Dr. Whitby, of McGill, were appointed scrutineers.

At the conclusion of the presidential address, a vote of thanks to Sir William Pope for the great services he had rendered the Society, was moved by the newly elected president, Dr. R. F. Ruttan, and seconded by Mr. H. W. Matheson, Chairman of the Montreal section.

Biological Chemistry Emphasized.

Dr. Ruttan, in moving the vote of thanks, referred to the note sounded in Sir William Pope's address regarding biological chemistry, and thought it a very striking feature of the trend of modern chemical science—namely, the development of industrial chemistry along biological lines. This was well represented by the production of acetone by the action of bacteria on starch, such as had been carried out at Toronto. Dr. Ruttan also referred admiringly to the production at Shawinigan of acetone from carbide and acetic acid. Eight to ten tons of acetone had been produced daily, and from twenty to thirty tons of acetic acid at a time when both were badly needed in the prosecution of the war.

The solidity of the British Empire as a real league of nations in itself was referred to by Dr. Ruttan. This league of nations was no sham affair, but was bound together by means of invisible ties of loyalty and affection to the Mother Country. Dr. Ruttan's remarks were heartily applauded.

On motion of Mr. T. H. Wardleworth and Dr. Milton Hersey, the annual report of the Society was taken as read. Some of the more important features of this report were as follows: The number of members on the register of the Society at July, 1921, was 5,654, as compared with 5,612 last year; since the last annual meeting 467 members have been elected, five former members have been restored to membership, and the losses have been 430, of which 59 were removed by death. A proposal has been received from the Chemical Society of Great Britain suggesting co-operation with the Society of Chemical Industry through the medium of the Local Sections, and the Council has cordially approved the proposal, but before adopting the working procedure the local sections are being consulted. The total value of the securities left to the Society by the late Dr. Rudolph Messel, F.R.S., as at July 28, 1921, is about £17,000. The Canadian sections having proposed Dr. R. F. Ruttan as president, succeeding Sir William Pope, the Council nominated him for election.

Mr. E. V. Evans and Professor Henry Louis were re-elected Hon. Treasurer and Hon. Foreign Secretary, respectively. Mr. T. H. Wardleworth, of Montreal, having been proposed by the Canadian Sections as a vice-president of the Society to succeed Prof. Henry Louis, who is now Hon. Foreign Secretary, the Council elected Mr. Wardleworth as a vice-president for the remainder of Prof. Louis' term. The Canadian Section has, during the year, been dissolved and separate sections formed at Montreal, Toronto and Ottawa, which, with the new section established during the year at Shawinigan Falls, and the Vancouver Section, make five Canadian Sections. An Executive Committee has been formed for Canada, consisting of the Chairmen and the Secretaries of the five sections, which committee will arrange for the annual Canadian Convention of Chemists, and also to take charge of matters affecting chemical industry that require action by the Dominion Government. As might be expected, the Montreal meeting unanimously endorsed the Report of Council, and the nominations as made by the Council for the offices mentioned in the report were all elected.

In the absence of the Hon. Treasurer, Mr. E. V. Evans, Dr. J. P. Longstaff presented his report, which was adopted on motion of Mr. C. S. Garland and Mr. M. L. Davies.

The first morning's session concluded with a vote of thanks to the Council of McGill University for their generosity in throwing open their buildings for the purposes of the annual meeting, the vote being moved by Sir William Pope and seconded by Prof. S. R. Church, Chairman of the American Section of the Society of Chemical Industry, and carried unanimously. Dr. Johnston received the vote on behalf of McGill, and expressed the great pleasure and honor it had been to have such a distinguished gathering of scientists meet within their doors.

Civic Reception and Luncheon.

At 1 o'clock, Monday noon, the civic reception and luncheon took place at the Ritz-Carlton Hotel. This luncheon was complimentary, being given by the Montreal Section of the Society, and was, to use a well-known term, "a classy" affair. Dr. Milton Hersey acted as chairman, and, after all had participated in the abundance of excellent food provided, called on Alderman Dr. Dubeau, who, in the absence of Mayor Mederic Martin, extended the welcome of the city to the chemists. As a man interested in scientific work at the University of Montreal, Dr. Dubeau expressed appreciation of the work the Society had done for the advancement of science and industry. The distinguished career of its preseident, Sir William Pope, showed how the science of chemistry could aid the Empire in the emergency of war. He pointed out the rapid growth of Montreal, both in population and industry. Montreal had grown to a city of 850,000, containing over 1,400 industries, and he hoped that the convention would be the means of directing greater attention to the importance of chemistry as an aid to industrial developments. In conclusion, Dr. Dubeau congratulated Dr. Ruttan on his election to the presidency of the Society, and remarked that this was a fitting honor for one who had won such world-wide recognition in the field of chemical research. Dr. Ruttan was a citizen and a chemist of which Montreal was proud.

Sir William Pope, in replying to Dr. Dubeau's address, referred especially to the fact of a scientific man such as Dr. Dubeau being interested in municipal development

That was something to be encouraged. "It is symptomatic of the difference between Great Britain and Canada," said Sir William, "that the acting mayor should be a gentleman at the head of one of the great scientific institutions in this country. That is almost an unknown thing in England, where men of scientific and academic attainments seldom enter municipal work, and we welcome the change."

Besides Dr. Dubeau and the officers of the Society, other guests at the head table included Major-General Sir Alex. Bertram, Hon. Smeaton White, and Captain Evan J. Edwards, H.M. Trade Commissioner, Montreal.

Visit to MacDonald College.

There was no session of the Society Monday afternoon, the members instead paying a visit to MacDonald College, at St. Anne de Bellevue, where they were the guests of Principal Harrison and the staff of the College. The journey to St. Anne's was made by train and motors, and on arrival at the station the party were conveyed in several wagon vans out to the College grounds. The vans were conviently driven through various parts of the large acreage surrounding the College buildings, so that the fruit trees and the different crops, which are grown for the instruction of the students in agriculture, could be observed. Stops were made at the Dairy and Poultry buildings, where some splendid cattle and pouitry were much admired by the visitors. The party were then conducted to the beautiful green in the centre of the several splendid buildings making up the College proper. It was certainly true that the visitors were impressed with the picturesque surroundings and fine buildings composing the site and structure of an agricultural college. Situated near the juncture of one of the branches of the mouth of the Ottawa with the St. Lawrence River, and with its beautiful green extending down to the water's edge, MacDonald College is ideally located. It was at this point on the river that Thomas Moore received his inspiration to write his "Canadian Boat Song."

There is no question but that the different buildings at MacDonald College are well appointed and equipped. In the auditorium of the main building a beautiful pipe organ is installed, and many of the visitors took advantage of the opportunity to rest a few moments here while the organist, Mr. Musgrave, rendered several selections. Following the visiting of the buildings, the party spent a short time on the grounds in informal conversation, while they were entertained by selections by the Boy Scout Band of Montreal, which band accompanied the party out from Montreal. About 5.30 p.m. all gathered in the large dining hall of the women's residence, where supper was served and short addresses were given by Professor Snell of the Department of Chemistry, MacDonald College, Sir William Pope, and Dr. Mills, principal at the Ontario Agricultural College, Guelph, from 1879 to 1904.

Professor Snell, in welcomiing the visitors to the College, referred to agriculture as one of the greatest of Industries in which chemical science—photo-chemistry—was the contro'ling factor. The College, he stated, stood not only for agriculture, but for the advancement of rural life generally, hence its departments of household science, etc. The Ontario Agricultural College at Gue'ph, Ont., was a much older institution than MacDonald, having been opened nearly a generation before. It was the desire of MacDonald College to do more in the way of agricultural research. The late Dr. William Saunders had given extremely valuable work to the advancement of agricultural science in the inauguration of the Experimental Farm at Ottawa.

Sir William Pope remarked that he had hardly thought it possible to have an agricultural college so well situated and so splendidly equipped. He thought it might be a mistake to have such lavish surroundings for such an institution, but it was a mistake that was often made in chemical colleges, and agriculture was a branch of chemistry.

TUESDAY, AUGUST 30th.

At the opening of the second day's session, Dr. Ruttan made his inaugural address as the newly elected president. He was greeted with prolonged applause as he rose to address the members.

Dr. Ruttan expressed his gratification at his election as President of the Society of Chemical Industry, one of the most distinguished positions in the world of chemistry, and which he accepted as a recognition of the position of the chemists of Canada, and an honor to them.

"In selecting me as the titular head of this society, said Dr. Ruttan, "it has paid Canada the highest honor in its power, and on behalf of the Canadian Section of the Society, I wish to express my sincere appreciation of this high recognition."

Proceeding, Dr. Ruttan discussed the intimate relation between app'ied chemistry and industrial progress, remarking that the Society formed the natural link between the University laboratories and the industries. With the industrial development since the war it was natural that chemical science should desire to play its full part in helping the world back to normal progress.

Extend Work in Canada.

He hoped that as a result of the present sessions, the Canadian Section of the Society would greatly increase, and that in the near future sections would be established wherever centres of industry existed throughout the world, the Society being more than national.

The war had shown that chemistry was at the basis of human industry, and he considered that the forces of public opinion and information must be mobi'ized by publicity to spread the appreciation and use of chemistry as the greatest helper to economic development of industry.

Public opinion required to be interested in the chemist and his work. The only way chemists could obtain recognition by legislative bodies, was by organizing and creating public interest.

He exemplified the news service of the American Chemical Society, which was accomplishing a great work for the industry. He thought they should do something similar in Canada, to get the co-operation of the press.

Meetings between the chemical societies on both sides of the Atlantic were very important, as tending to harmonize the aims and ideals of the profession in different parts of the Empire.

"Canada," concluded Dr. Ruttan, "is yet not much advanced beyond the pioneer stage of industrial development, and we have not much more than touched the fringe of utilization of our national resources. Your visit to the Dominion and your choice of a Canadian president, will have rich fruition if it leads to the further introduction of scientific methods in our industries for, if Canada is to progress as she should, the footings of her industries must be established on the bedrock of sound principles and scientific organization." (Applause.)

Need for Reform in the Education of Chemists.

Following Dr. Ruttan's address, the first paper of the technical sessions was contributed by Dr. Lash-Miller, Professor of Physical Chemistry, University of Toronto. The subject of Dr. Miller's address was "Need for Reform

in the Education of Chemists," and proved one of the most original and thought-producing contributions to the convention.

Dr. Miller stated in part that public opinion had come to recognize that a progressive chemical industry was essential to the safety of the state, and more was now expected of our chemists than ever before. Very few of them, however, had any real grip on the mathematical side of modern chemistry. The training offered by the universities was, in many respects, very much the same as when chemistry was a mainly experimental science, and encouraged the growth of mental habits that were wholly inadmissible now that the science had become largely deductive. The reform most needed was the general adoption of well defined terms, many of which have long been proposed, in place of the vague expressions in common use. Any student would assert, for instance, that gunpowder was a mechanical mixture, but very few could say what laboratory results would justify placing a newly discovered substance in the same group; they were content to use words without knowing what they mean. The reason seemed to be in the too early use of atomic and molecular imagery, and the speaker gave a number of instances to show that until a student learns to think without them, our atoms and molecules were to him a mental poison. The second reform suggested was, "Cut out the atoms and the molecules," at least until the student had acquired ability to handle those thermodynamic calculations which are usually regarded as so difficult and which play so important a part in modern scientific and industrial chemistry. The third reform consisted in showing the student that chemistry, like any other branch of knowledge, was but a description, classified record of observed facts, and that the toleration of ambiguity or mysticism was a fatal bar to any considerable attainment.

The speaker then gave details of a course of instruction based on these reforms, by means of which students could be trained to solve the difficult quantitative problems that arise in modern chemical industry.

Following Dr. Miller's address an animated discussion occurred. Sir William Pope did not favor the doing away with the teaching of the molecular and atomic theory, even to elementary classes, but he did strongly agree that students should have a better mathematical training before beginning the study of chemistry. Such mathematical training was insisted upon in Great Britain. Sir William was also convinced that his students could solve the problems in thermodynamics, although their teaching was based on instruction in the molecular and atomic theories, just as readily as students instructed according to Dr. Miller's plan.

To all that Sir William had said, Dr. Miller graciously but none the less firmly, replied, "standing by his guns" and expressing a keen desire to see such a student as Sir William referred to, but no direct offer to transfer students from Cambridge to Toronto was made.

High Speed Paper Machines at the Laurentide Company's Plant.

The next paper on "The Problems Encountered in the Development of the High Speed Paper Machines, at the Laurentide Company's Plant at Grand Mere, and Their Solution," by Mr. Geo. D. Kilberry, chief engineer, paper machinery department, Dominion Engineering Works, Ltd., Montreal, was read by Mr. J. L. Stephenson, editor of "Pulp and Paper Magazine of Canada," in the absence of Mr. Kilberry. Some of the more important facts mentioned in Mr. Kilberry's paper were as follows:

The new 166-inch news machines installed in the Laurentide Company's mill at Grand Mere, Que., probably represent the very best effort heretofore applied to the design and construction of news machines, and the recent results obtained amply justify the Laurentide Company in believing that they have reached the goal selected, namely, marketable paper at 1,000 feet per minute or better as a continuous opration.

The Dominion Bridge Company had the mechanical equipment necessary to start this work and was selected for the contract, although they were very new in the paper machinery game.

The first step, then, was to secure the services of an engineer to design the machines satisfactorily to the Laurentide Company. Mr. Kilberry was selected by the Dominion Bridge Company from past experience with high speed news machines in the States. The preliminary drawings were started in October, 1919, and the first detailed drawings were put in the shop in December of the same year.

These machines embody no new principle in paper making, but have some features of design not common to most machines, chiefly the method of putting on new wires, the application of suction couch and suction press rolls, the novel arrangement of compressed air jets for passing the tail or ribbon of paper from couch to press, and between the presses as well as at the calendars and reel, and a very generous use of ball bearings at the wet end of the machine.

The fourdrinier part of the machines is constructed without the usual shaking arrangement as it has been demonstrated that there is no more need for shake on a news machine than five wheels on an automobile. The machines are driven by the Karland Engineering Company's patented Interlock Sectional Drive.

In conclusion it was pointed out that considerable satisfaction comes from the knowledge that a great many of our wiseacres both in the States and abroad were disappointed in their predictions as to the outcome of the new machines, as it was freely predicted that these machines could not be built with any degree of success. It seems however, that the performance of these machines has established a record that will keep some of our fellow builders guessing what the next high mark will be.

Action of Thiocyanate Solutions on Cellulose.

The paper by H. E. Williams on "The Action of Thiocyanate Solution on Cellulose" was read by Mr. R. Clayton in the absence of Mr. Williams. This paper constituted one of the most important presented at the meeting and will be given in full in an early issue. Its chief point was the showing of the advantages to be gained by replacing of sulphuric acid in the making of parchment paper by calcium chloride—thiocyanate solution. The main advantage was that the parchment could be left in the new solution for a longer time than in the sulphuric solution without dissolving the cellulose, and for the same reason the parchment did not have to be washed off as soon.

Pulp and Paper Progress.

The session was then treated to moving picture views of the pulp and paper industry as carried on by Price Bros. in their pulp wood reserves, and at their plant at Kenogami, Que. The views were admirably explained by Mr. A. L. Dawe, who gave some very interesting facts on the subject. He pointed out that today there were 96 mills

engaged in the manufacture of pulp and paper in Canada with a total capital of over $300,000,000, employing normally 25,000 men. The largest output was newsprint, with an annual production of nearly one million tons, being twice as much as was produced in Great Britain, and about one-half of the United States production. The rapid growth of the pulp and paper industry was largely due to the development of education and the consequent demand for more newspapers, journals, books, etc. A very important feature of this growth of the paper industry, and also one of the chief reasons why it had been able to grow was the application of chemical science to the industry. There was, Mr. Dawe said, scarcely a mill in Canada worth considering that did not rely on technical control. It was hoped that much further work along this line would take place, as two problems needing the attention of scientific minds were, the utilization of the waste liquors of the mills, and the utilization of the waste fumes.

Tuesday Luncheon.

At the conclusion of the paper industry slides, the members adjourned to the Windsor Hotel for lunch, with Sir Frederick Williams-Taylor as chief speaker and Mr. H. W. Matheson, chairman of the Montreal section, presiding.

Properties of Pure Hydrogen Peroxide.

The Tuesday afternoon technical session opened at three o'clock with an address by Dr. Maas, of McGill University, on "The Preparation and Properties of Pure Hydrogen Peroxide," that is 100 per cent. peroxide. The research in connection with this important work was carried on by Dr. Maas at McGill. A synopsis of the address follows:

Hydrogen peroxide is the name commonly applied to an article which may be procured in any drug store, but this really consists of a three per cent. aqueous solution which generally contains as well inorganic salts, a little acid and other impurities. The water and other impurities are removed in three stages. The first consists of a vacuum concentration and distillation to a 35 per cent. pure aqueous solution. This is then concentrated to a 90 per cent. solution and the latter subjected to fractional crystallization, the end product of which is the 100 per cent. Special apparatus was designed for this work, including a sulphuric acid pump which alone made it possible to obtain large yields. Strong solutions of hydrogen peroxide were prepared in the past and were reputed as being highly explosive and several serious accidents are recorded. This instability is due to the presence of impurities. Pure acid free hydrogen peroxide is not explosive.

Hydrogen peroxide solutions are used as a disinfectant and are excellent for this purpose. The presence, however, of acid beyond a certain amount renders it harmful and the manufacturer now takes great care in this connection. In the case of 100 per cent. hydrogen peroxide the temporary application to healthy tissue is to bleach it an intense white, no blister results. After a few hours the place where the application was made is perfectly normal. Diseased tissue, on the other hand, is destroyed. Here also if the peroxide is contaminated by acid, it causes a severe burn.

At ordinary temperature the 100 per cent. peroxide is a transparent liquid with about the same viscosity as water but one and a half times as dense, and with a much greater refractive power. Many of its physical properties were measured. It is very active chemically; a speck of metallic sodium causes it to explode with extreme violence. The properties of the pure peroxide are of particular theoretical interest, and many new reactions can be studied and new compounds made with the 100 per cent. peroxide.

The National Drug & Chemical Company of Canada greatly assisted the carrying on of this work by supplying the chemicals required with a view to furthering scientific research.

The Chemistry of Rubber.

Following Dr. Maas' address, Dr. G. S. Whitby, of McGill University, contributed a very able address on "Observations in the Chemistry of Rubber."

In his paper Dr. Whitby touched on a variety of points of interest in the researches which he and his co-workers have recently conducted at McGill University in the chemistry of raw rubber and the vulcanization of rubber. He described an investigation of the resin of rubber, which represents the first successful attempt to elucidate in some degree the problem of the chemical nature of a constituent of raw rubber which, although present in only a small proportion, has an important influence on the behavior of the rubber when the latter is vulcanized, and in other ways. Dr. Whitby's investigations show that a considerable number of crystalline substances can be isolated in small amounts from raw rubber. One of these substances is an interesting sugar-like body, which was known to occur in rubber latex, but the presence of which in prepared rubber was unexpected, on account of its great solubility in water.

Experiments were described on the artificial conversion of rubber into a resin as a result of the absorption of oxygen from the air under the influence of catalysts. One mode of carrying out this conversion, which Dr. Whitby has worked out, may lead to the production of lacs or varnishes from rubber. The study of the conversion is also of importance because of its relation to the "perishing" of rubber goods.

Within very recent years it has become the practice in the rubber industry to hasten vulcanization by the use of small amounts of certain organic chemicals known as vulcanization accelerators. Dr. Whitby outlined the results of a systematic study of a number of such substances and particularly decribed results with one accelerator which had been found to be so active that remarkable results were obtained by means of it. This accelerator increased the speed of vulcanization by 300 to 400 times and was probably the most powerful speeder of vulcanization hitherto known. Dr. Whitby drew attention to some of the interesting and hitherto unrealizable improvements in rubber manufacture which the employment of such substances made possible.

Heat Intercepting Glass.

"The Manufacture, Properties and Employment of Heat Intercepting Glass" was the subject of an excellent paper by Professor Gelert Allerman of Swarthmore College, Penn.

In introducing his subject he described how silver nitrate when exposed to the action of light passing through ordinary glass is discolored, while if placed in a container of special glass no change is noticed. Similarly smoked bulb thermometers exposed under the same conditions will record different temperatures, that which the ordinary glass is used showing a higher temperature than that protected by the special glass.

Sir William Crooks was the first to investigate glass with the object of securing a spectacle glass which would protect the eye from heat and ultra violet rays and reduce glare. He concluded that cerium salts were most effective in this way and black mica added to the melt pro-

duced a glass which almost completely obstructed the invisible heat rays.

About five years ago Mr. Sherman, then Chief Chemist of the Pennsylvania Wire Glass Company, conducted 227 experiments, using various mixtures, and confirmed Crook's work and produced a more brilliant glass by a slight manipulation of the furnace temperature. This material is now a commercial product known as Actinic or heat intercepting glass, manufactured into plate polish, plate wire, plate roof wire, aqueduct wire, ribbed wire, and corrugated wire glass. These different types were described, emphasis being laid upon the importance of annealing. An instance was given of the resistance of the corrugated wire glass to shock. A 2¼-inch shell smoke stack 24 inches in diameter and 25 feet in length fell in a severe wind storm on the corrugated wire glass roof of a large boiler house. While two plates were destroyed and the remainder of the glass cracked or bent, it was not shattered and did not leak although the steel beams on which the glass rested were bent out of line about three inches. In addition to the advantages regarding the transmission of light the absorption of heat and the elimination of glare, the use of this glass as a structural material would be valuable for the erection of fireproof permanent buildings; in addition to which a building constructed of glass is cheaper than one built of any other material.

Tables were shown covering tests made on houses erected of the various types of heat intercepting glass showing the marked difference between the temperatures inside and outside the house and also showing the high percentage of light transmitted, the lowest being 72 per cent.

Large amounts of this glass have already been made and employed. It was used in the construction of the largest air ships hangar building in the United States, the purpose of its employment being the prevention of injury to the fabric of the balloon by the sun's rays. It is also used on the roof of the Indianapolis railway shed which is entirely free from glare and the coolest structure of its kind in the summer.

When rain drops appear on wind shields of this glass it does not interfere with its clarity, which suggests another use for it, and street car motormen have found it of great service in reducing the glare of automobile headlights.

Annual Banquet.

The annual banquet of the Society held Tuesday evening at the Engineers' Club was a brilliant success and will long remain a very happy memory to all those who were present. Sir William Pope was the chairman of the evening. There was a lengthy list of toasts that inspired many brief but splendid proposals and responses. Sir William opened the speech making by proposing the toast to Canada, and referred to the remarkable combination in Canada of British and French history, which was so admirably represented in the Hon. Senator R. Dandurand, who would respond to the toast. In his reply Senator Dandurand dwelt upon the advantages which the universities enjoyed in Canada in having both the British and French civilizations to draw upon for their inspiraton.

The toast to "The Society" was proposed by Mr. Henry Holgate of Montreal, and replied to by Sir William Pope. In replying, Sir William spoke of the manner in which the British, French and American scientists had worked together during the war, and he hoped that in Canada there would be ample scientific development encouraged by both peoples.

"The Canadian Sections and First Canadian President" was proposed by Mr. F. W. Gamble of England, and most ably responded to by Dr. R. F. Ruttan and Colonel (Dr.) W. R. Lang.

"Our Overseas Members" was next proposed by Mr. T. H. Wardleworth of Montreal, and replied to by M. C. S. Garland of England, and Professor Pandya of Agra, India. Professor Pandya's address along the lines of imperial development was received with much applause.

"Our American Members" was proposed in a brief but stirring manner by Mr. M. L. Davies of Toronto and responded to by Dr. W. H. Nichols and Prof. S. R. Church of New York All these gentlemen emphasized the growing cordiality that existed between the British and American peoples

Dr. F. W. Atack of England proposed the toast to "Sister Societies" and reply was made by Dr. Edgar F. Smith, president of the American Chemical Society. "Our Guests," the last toast, was ably proposed by Mr. C. R. Hazen of Montreal, and reply was made by Dr. R. A. Ross of the Engineering Institute of Canada. During the evening Mr. H. J. Roast announced that Sir William Pope had been unanimously elected as an honorary fellow of the Canadian Institute of Chemistry.

Those present at the head table included: Dr. Milton L. Hersey, J. D. Hudson, Dr. F. W. Atack, Dr. C. H. Herty, Prof. J. W. McBain, S. R. Church, H. W. Matheson, F. W. Gamble, R. H. Clayton, T. H. Wardleworth, W. H. Nicholls, Prof. R. F. Ruttan, Harold J. Roast, Hon. Raoul Dandurand, Henry Holgate, Col. F. M. Gaudet, C. S. Garland, Dr. J. P. Longstaff, Dr. W. A. Noyes, Dr. W. L. Goodin, M. L. Davies, Dr. F. W. Skirrow, Col. W. R. Lang, Prof. Pandya and C. R. Hazen.

WEDNESDAY, AUGUST 31ST, 1921.

Dr. C. E. K. Mees of the Eastman Kodak Company, Rochester, N.Y., was the first speaker at the morning session on Wednesday, when he gave a paper on "The Preparation of Synthetic Organic Chemicals," which ranked as one of the very best presentations at the convention.

Dr. Mees first took up the status of chemistry of the present day as compared to that of ten years ago, emphasizing the need of research and its co-operation with industry.

Before 1914 the supply of synthetic organic chemicals was entirely in the hands of one or two firms in Germany. With the outbreak of hostilities, this supply was cut off and the effect was soon felt. Many researches had to be abandoned. Prof. C. G. Derick, of University of Illinois, met the situation by inviting the most promising students to work during vacation on those organic compounds most needed by his department. This was an unique step, the reactions being conducted on a scale unusual in research work. As it was very evident that the supply of organic chemicals was inadequate the Eastman Kodak Company in 1918 decided to enter the field, having no prospect of immediate profit; high labor costs, materials more expensive than previously, and finally trained and capable chemists practically unobtainable. The work undertaken was: 1. Synthesis of compounds which are not prepared technically but are required for laboratory purposes; 2. purification of technical materials got from chemical manufacturers;

3, distribution of such technical chemicals in form in which purchased.

Raw materials were obtained largely from dye, dye intermediate, perfumery, explosives and pharmaceutical chemical manufacturers, also from individuals in university and other laboratories.

The chemicals produced are classified under: 1, the Eastman chemicals (highest possible purity); 2, the practical chemicals (purity sufficient for synthesis); 3, technical products (as from large scale manufacturers).

Girls were at first employed (men then being out of the question) in an improvised laboratory. After two years, they were transferred to a new specially designed laboratory, all the work being done on a purely laboratory scale. Filtration is carried out principally in the usual Buchner suction funnels. Heating is usually effected by means of a free gas flame under a wire gauze, oil-bath or calcium chloride bath. For certain purposes steam-jacketed kettles are used. Distillation is carried out entirely in glass, flasks with long side-arms being employed in order to avoid contamination from stoppers, the receiver acts as the condenser by means of a stream of water. The same principle is employed for vacuum distillation. For fractional distillation a column of special design is employed, a current of air (easily controlled) is passed down through the outer jacket. Steam distilation also, is extensively employed, an all-metal condenser if possible being used. In case of less volatile compounds, vacuum distillation in a current of superheated steam is found invaluable. The principle of the vacuum pan has also been adapted to the laboratory uses. Stirring is in all cases carried out by means of the centrifugal stirrer, made of glass; for large work one of iron and belt driven is employed. Extraction with various solvents and separation is done in the usual way, e.g., in glass vessel hand-shaken; separatory funnel; a semi-automatic device for larger amounts of liquid; also a modification of the Soxhlet apparatus. Pyrex glass is used exclusively in the laboratory.

From the financial point of view, the work has been conducted at a considerable loss, the last year showing a loss exceeding $14,000. This result was due to the attempt to cover a wide range of chemicals and make them available in as short a time as possible, instead of making profitable ones, of high demand, when the financial loss could have been averted and a profit made. But this would mean abandoning the aims of the undertaking. However, at present, things are much more hopeful due to: greatly increased number of chemicals available; the wider knowledge of the existence of the department throughout the country; the improved methods of preparation and lower costs. Hence in the current year, while it is improbable they will show a profit, it is likely that it will be able to meet its own costs and hence must be considered as successful in establishing in the United States a source of organic chemicals available for the research workers.

At the conclusion of Dr. Mees' address a vote of thanks to the Eastman Kodak Company for their interest in science and for the splendid work they had accomplished for chemical science in particular, was unanimously carried.

Briquetting of Lignite.

A paper on "The Briquetting of Lignite," by Mr. Leslie Thompson of the Lignite Utilization Board, was then presented.

Mr. Thomson described the work that has been done on lignite briquetting by the Lignite Utilization Board since its inception in October, 1918, and illustrated his paper with a number of diagrams, drawings, and tables of results.

The Provinces of Manitoba and Saskatchewan are largely dependent upon American anthracite coal for domestic heating purposes and during the years preceding the war about 500,000 tons were annually imported. The price of this imported coal naturally increased as one went westward, owing to the higher freight charges. It continued to find a market until the price went so high that the consumers were willing to put up with the disadvantages of the much cheaper Alberta coals. This "peak" line runs in a general north and south direction through the eastern part of Saskatchewan. Directly beneath this area, however, there are very large deposits of rather low grade lignites, which, after carbonizing and briquetting are capable of being converted into a fuel possessing high calorific value.

The Lignite Utilization Board was therefore established by the Canadian Honorary Advisory Council for Scientific Research to attack this problem and, if possible, to demonstrate the feasibility of producing a satisfactory domestic fuel from these lignites by the method of carbonizing and briquetting. The board is composed of three members: Mr. R. A. Ross, E.E., D.Sc., chairman, representing the Dominion Government; J. N. Leamy, M.E.I.C., representing the Manitoba Government, and the Hon. J. A. Sheppard, representing the Province of Saskatchewan. Mr. Leslie R. Thomson (the author of this paper) is the secretary and the technical staff includes Mr. Edgar Stansfield, M.E.I.C., and Mr. R. A. Strong, chemists, and Mr. R. DeL. French, M.E.I.C., Engineer.

After preliminary experiments at the Fuel Testing Laboratory of the Department of Mines, Ottawa, into various phases of the methods to be adopted, a plant was designed and erected at Bienfait, Sask., to have a capacity of one hundred tons of briquettes per day and has just been put into operation.

At this plant the lignite is first carbonized by heating to a low temperature in order to drive off the more volatile portion and the residue is mixed with a coal-tar pitch binder under suitable control and after grinding together the mixture is pressed into briquettes in a roll press. The briquettes weigh about two ounces each and are egg-shaped. The average approximate analysis of the raw lignite used and of the finished briquette is:

	Raw Lignite.	Carbonized Briquette.
Moisture	33%	4.3%
Volatile Combustible Matter	26	19.4
Fixed Carbon	32	59.8
Ash	9	16.5
British Thermal Units	7100	11280.

A summary of the Board's briquetting results may be presented as follows:

1. It has been possible to make a first quality commercial fuel briquette from carbonized lignite, using any one of such binders as coal tar pitch, petroleum pitch, hardwood tar pitch, sulphite liquor pitch, or by using combinations of them.

2. The quantity of binder required is much in excess of that necessary to make a correspondingly good briquette from anthracite fines.

3. A waterproof briquette of carbonized lignite cannot be made using sulphite pitch as a single binder unless the briquettes are heat treated subsequently.

4. The choice of binder does not rest so much with the technical difficulties involved in its use, but with the economic supply of that particular binder. In other words, the Lignite Board has succeeded in making good briquettes from many binders.

5. The Board has decided to use as a binder coal tar pitch supplied by the Dominion Tar and Chemical Company from Sault Ste. Marie, for the preliminary period of operation.

Peat and Its Preparation for the Market.

Dr. Ernest V. Moore, engineer in charge of the peat development work of the Ontario Government at Alfred, Ont., followed Mr. Thompson's interesting address with an equally interesting and able paper on "Peat and Its Preparation for the Market."

In his paper Dr. Moore described a practical method of turning raw peat into a product of economic value. Peat is a combustible substance produced by slow decomposition of vegetable matter and occurs saturated with water in peat bogs typical of the northern hemisphere. To transform raw peat into combustible material it is necessary to reduce its water content of 90 or 95 per cent. to about 30 per cent. Drying is effected best by evaporation in the open air.

Great difficulties of collecting peat are overcome by gathering it with a combined excavator and macerator which is supported on caterpillar-tread carrying elements—a device more useful than rails on a soft peat bog. The raw peat is carried by a belt conveyor from the macerator to adjoining higher land where it is spread from 3 to 6 inches thick on the ground, cut into blocks and allowed to dry in the sun. The blocks are turned to insure uniform drying, and in from 30 to 40 days the moisture content drops to 30 per cent. and the peat is ready for domestic use or even for some industrial uses—especially drying operations where a very clean fuel is necessary.

Although peat has not been available in sufficient quantity for extensive investigation, progress has been made in turning air dry peat into more efficient fuel by briquetting, by drying and pulverizing, or by converting it into fuel gas or elecrticity and recovering valuable by-products in the same operation. Also it is possible to produce from peat high grade charcoal or coke and at the same time to recover valuable by-products. In the United States the use of peat for fertilizer is very extensive.

Though air dry peat has twice the volume of an equal weight of coal, Dr. Moore declares that the average householder would gain by replacing 20 per cent. of his anthracite pound for pound with air dry peat. Following his paper on peat, Dr. Moore showed a series of lantern slides taken at the experimental plant operated by the Peat Committee at Alfred, Ontario, and finally a moving picture reel showing some of the machinery in operation.

Conclusion of Technical Sessions.

Owing to lack of time it was greatly regretted that the papers prepared by Professors Bain and Ardagh, of the University of Toronto, were not read to the meeting, and consequently the paper and moving pictures on peat brought the technical sessions to a close. For the benefit of our readers we give here short abstracts of the papers by Professors Bain and Ardagh. The regulations of the Society prevent publishing any paper in full before it appears in the journal of the Society. Professor Bain's paper was on "Theoretical Considerations on the Hargreaves Process," and that of Professor Ardagh "The Activation of Carbon."

In his paper Professor Bain stated that since air as well as sulphur dioxide and steam is passed over sodium chloride in the Hargreaves process for the manufacture of sodium sulphate, it appears at least possible that in the absence of air, sodium sulphite would be formed. This, however, is not the case, and Keppeler has suggested that sodium sulphite if formed would decompose into sulphate and sulphide at the temperature usually employed. This has been found to be the case and a partial study of the equilibrium between sulphite, sulphate, and sulphide at several temperatures has been carried out.

Arguing that the sodium chloride acts as a catalyst for the production of sulphur trioxide in the Hargreaves process, Professor Bain finds that if sulphur trioxide be first formed by passage of air and sulphur dioxide over heated ferric oxide, the rate of formation of the sodium sulphate is very largely increased.

Prof. Ardagh in his paper on "Activated Carbon" pointed out that of all the so-called common elements carbon appears to possess greater possibilities both to the investigator in pure science and the researcher in the industrial field.

The paper deals with amorphous carbon, more especially with its power of absorbing colors from liquids and gases, the phenomenon generally known as adsorption. The progress that has been made in this field is shown to be very considerable particularly during the last ten years. Carbons are today being manufactured that are replacing to some extent Fuller's earth as a decolorizing and deodorizing substance in certain industries, and it is not too much to hope that in the not distant future a carbon sufficiently active as a color remover may be produced at a price to supplant bone black in the manufacture of sugar and syrups.

The work of Dr. N. K. Chaney of the United States Chemical Warfare Service has thrown an entirely new light on the causes of activity in carbon. Basing their work on Chaney's hypothesis the Chemical Warfare Service of the United States were able to produce absorbents for gas bask canisters that were greatly superior to any the enemy were able to make.

Professor Adragh describes the installation he set up to carry out experiments on a small scale for the preparation of active carbons from sawdust. In conclusion he gives some helpful suggestions to others who wish to carry on further experimentation in this field.

Special Convocation at McGill University.

After luncheon at the Windsor Hotel, at which Mr F. J. Hambly was chairman, and the Hon. Jaques Bureau, M.P., (Three Rivers, Que.), the guest of honor, the members returned to McGill, where a special convocation was held for the purpose of conferring the degree of LL.D. upon Sir William Pope. Sir William was presented for this honor by Dr. Ruttan.

Following the convocation a garden party was held on the beautiful grounds of the university, at which the leading educationists of the city were present. This was a most enjoyable affair and brought the annual meeting at Montreal to a close.

Overseas Delegates Entertain Hosts.

On Wednesday evening, August 31st, a very happy event was staged by the overseas delegates when they entertained their Canadian hosts to a dinner of the "Ancient Order of Trismegistians." This honorable order had been formed especially for the occasion and the ritual included the presentation to Dr. Ruttan of a "piece of plate" and an "illuminated address," the former consisting of a piece of dinner plate, and the latter a card mounted in a silver frame with an electric flash-light "illuminating" it, the card bearing the name and "address"—"Dr. R. F. Ruttan, Society of Comical Industry, Sensible House, Fairand Square, London." Following the presentation, as is the custom in this Order, Dr. Ruttan was obliged to give a song. The event proved thoroughly enjoyable, and Sir William Pope, who proved that he had a good reserve of wit and humor as well as of science, contributed not a little to the enjoyment of all.

Visits to Montreal Industries.

The overseas members having arrived in Montreal during the week prior to the annual meeting, opportunity was taken to visit some of the leading industries of the city. The St. Laurence Sugar Refinery, Gillette Razor Co., Marx & Rawolle, and the National Drug and Chemical Co. They were also the guests of the Montreal Harbor Commissioners, and were entertained to luncheon on board the steam yacht on which an inspection of the harbor was made. Chief engineer, F. W. Cowie and Commissioner R. A. Ross were the hosts at this luncheon.

The Trip to Niagara Falls by Way of Shawinigan, Ottawa and Toronto.

The visitors of overseas and American chemists to points outside of Montreal were somewhat hurried, as one day only was available for each of the following stops: Shawinigan, Ottawa, Toronto, and Niagara Falls.

Shawinigan was the first stop, and in true Shawinigan fashion the visitors were received. As a matter of fact, the party went through in special cars to Grand Mere, and were guests of the Laurentide Co. during the morning. They visited the power plant and all departments of the paper mill. At Shawinigan they were received by the local committee, of which Dr. F. W. Skirrow is chairman, and F. E. Dickie secretary—Messrs. H. S. Reid, H. C. Neeld, G. Meerbergen, O. G. Morrison, Mr. Neilson, W. C. Hovey, F. H. Andrews, E. R. Williams, G. R. Hale and W. G. Dauncey, who did everything possible for the entertainment of their guests, and the luncheon and dinner at the Cascade Inn were among the most enjoyable functions of the trip. The beauties of the river were appreciated and amazement shown at the magnitude of the chemical developments. The plants of the Carbide Company and Canadian Electro-Products were inspected. Following an enjoyable dinner, presided over by Dr. Skirrow, and bristling with happy and numerous speeches, the party left for Montreal and Ottawa, arriving in Ottawa the following noon. Through the courtesy of the Canadian Pacific Railway, the train was slowed down while passing through Alfred, in order that a good view of the operations of the peat bog might be had.

Ottawa.

On arriving at Ottawa, the party was taken to the Rivermead Golf Club, Deschenes, for lunch. During the afternoon, the plant of the British America Nickel Co. was visited by one-half of the party, and the Parliament Buildings by the remainder.

At the nickel refinery, the operations of the Wedge Mechanical Furnace was explained, as well as the method of leaching and the system of cells for depositing electrolytic nickel and copper. This company is undertaking the production of malleable nickel sheets, rods, and wire, and also the recovery of the rare metals occurring with the platinum. Under the Madsen patents, they are in a position to produce nickel tubes and large sheets. They have already deposited sheet from an anode 19 feet 6 inches long and 5 feet 2 inches wide, with a thickness of .07 inches.

Later in the afternoon, tea was served at the Dominion Government Experimental Farm, and a drive taken around the parks of the city. In the evening a dinner was given at the Chateau Laurier. Mr. F. J. Hambly presided as chairman of the Ottawa section, and a welcome from the Dominion Government was given the visitors, by the Hon. Minister of Labor, Senator Robertson. Sir William Pope in a few words, expressed the appreciation of the Society and visiting members, and dwelt upon the place of chemistry in research work and industrial development. At 11 p.m. the party was again on its way.

Toronto.

Arriving at Toronto, during the time when the Canadian National Exposition is in full swing, presents some problems. These were solved for the guests by the University of Toronto. The authorities welcomed the visitors to the facilities of residences and college halls, and for the moment Victoria College was at their disposal. During the morning the Harbor Commissioners gave the party two pleasant hours on the Bay and some idea of the magnitude of the industries centered at Toronto was obtained. The Exhibition management had very graciously remembered the visit of the chemists by naming Saturday, September 3rd, "Chemical Day." Sir William Pope was the chief speaker at the Directors' Luncheon, while the majority of the party were entertained at the Sunnyside Pavilion of the Harbor Commission. During the afternoon the city was covered by motor, and the Chemical Section of the Exposition visited. Here a further idea of the development of some Canadian chemical industries was obtained. During the evening the party viewed the entertainment before the grand stand.

Niagara.

Sunday, September 4th was the only day during the trip when the plans of men went slightly astray before the uncontrollable forces of nature. Lake Ontario chose that particular day to impress our visitors from overseas with her magnitude. She staged a real Channel crossing which, it is safe to say, will be remembered by everyone. The damage done was not sufficient to keep most members of the party from taking in the wonderful scenic trip up the American side of the Niagara Gorge to the Clifton Hotel. The remainder of the day was spent viewing scenes of interest at the Falls; and Monday, under the direction of Mr. P. W. Ellis, the party inspected the Chippawa Power Canal. On this trip they were joined by a number of friends from Niagara Falls, N.Y., and a final luncheon on Canadian soil was given at the Refectory in Queen Victoria Park. The magnitude of the engineering problems in this work gave everyone some idea of the power facilities soon to be available in Ontario.

At three o'clock an official welcome from General Kincaid on behalf of the Governor of New York State was presented to the visitors at Niagara Falls Club, New York. The American reception committee represented the leading chemical societies in the United Stats: Dr. W. H. Nichols, David Wesson, Prof. Church, Acheson-Smith and A. H. Hooker. After a very short stay the party moved on to Buffalo, where again a most hearty reception was extended. Following a dinner, the party left over night for Syracuse, where the plants of the Semet Solvay Company were visited.

The night boat down the Hudson from Albany completed the trip to New York.

MAPLE SUGAR PRODUCTION IN QUEBEC.

During the last three years the maple sugar production has increased threefold in the Province of Quebec, now amounting to 30,000,000 lbs. annually, valued at $7,000,000. This increase has been mainly due to the scarcity of beet and cane sugar, but another important factor has been the establishment of sugar-making schools. These schools have been established by the Provincial Department of Agriculture, and in addition many demonstrations in sugar-making are given in all parts of the province by special instructors sent out at the expense of the department. The Quebec product also owes its high reputation to a considerable extent to the stringent regulations which are in existence for the prevention of adulteration.

Chemistry and Reconstruction of Industry

Address Delivered to Montreal Convention by Sir William Pope—German and British Technology Compared and Biological Chemistry Emphasized.

THIS is the first occasion on which the annual meeting of the Society of Chemical Industry has been held in the Dominion of Canada. There is something peculiarly appropriate just at the present time in the inauguration of what I trust will prove an endless series of such meetings outside the British Isles. Our nation has but recently emerged victorious from the greatest war in the history of mankind; we feel that one of the most wonderful circumstances of that struggle—the one, perhaps, which will appeal more strongly than any other to the imagination of historians in centuries to come—is the unanimity with which all the multitudinous races included within the British Empire responded to his Majesty's call and poured out blood and treasure unstintingly in the common cause. The war proved that our Empire is no loosely-connected aggregate of countries but represents a single vast community of men and women; the smaller interests of districts or of people are indeed not identical, but we all share the one main interest, namely, that of the welfare and the progress of the Empire to which we belong.

The Society of Chemical Industry stands out from amongst the majority of scientific and technical associations in being an Imperial Society; its activities are not limited to the small confines of the mother islands, but we have vigorous and prosperous Sections in many parts of the Empire. It is even more than an imperial Society in that it has a powerful Section in the United States; we can justly claim to represent not only the British Empire, but also the whole Anglo-Saxon race in matters of chemical technology, for we have large bodies of members wherever the English tongue is spoken.

The wide field covered by our Society makes it all-important that its many Sections should be managed energetically and should represent each an active body of members intent on the advancement of our subject; this is especially true just now when the scientific, industrial and commercial activities of the whole world are undergoing reconstruction.

It is unnecessary for me to enlarge on this theme before an audience composed mainly of our Canadian members; you have already acted upon it and the Canadian organization now consists of five Sections of the Society of Chemical Industry. The advantages of the new system of working are obvious, and we look forward with confidence to seeing their effect in increased numbers of papers on original work in our transactions. In connection with your reorganization attention may perhaps be directed to one point. Great efforts are now being made by our Council and Publications Committee so to alter the character of our Review as to make it more readable and of more general interest; most of us are anxious to be kept fully informed upon the doings of our members, and it is particularly difficult to collect information concerning those who are far from headquarters. If in organizing your Sections you can arrange to provide the editors with prompt information on matters of interest you will do the Society a great service. Two years ago the financial position of the Society was causing the Council grave apprehension; today, I am happy to say, our greatest anxieties concerning finance have vanished and you will have seen from the balance-sheet that whilst economy is still necessary, the need for parsimonious conduct of the Journal no longer exists. In this connection mention should be made of the munificent bequest to the Society by the late Dr. Rudolph Messel, one of our former presidents, and one of the most devoted promoters of the Society's objects. The capital value of the bequest is in the neighborhood of £20,000, and consideration is being given to the question of how best to apply the income to advantage; meanwhile, it has been decided to perpetuate the memory of our late friend by the establishment of a medal and a memorial lecture to bear his name.

Seven years ago the situation and the outlook in all branches of scientific industry were very different from those which now confront us.

War and Post-War Problems.

In 1914 certain of the chemical industries of Great Britain were expanding slowly but steadily, whilst others were slowly but just as surely shrinking before foreign competition; in some of the chemical industries Great Britain was supreme, but in others we were losing ground. At that date, chemical industry was expanding rapidly in this great Dominion, and all the virility of a growing population was being devoted to the utilization of the vast natural resources of a previously but partly developed country

The interval has seen the commencement and the conclusion of a great conflict, a war which has reduced to mediocrity several of the dominant European powers, and has left nearly every nation struggling under an accumulation of debt. Throughout the war the Dominion, like every component part of the British Empire, devoted itself actively to the production of foodstuffs and of munitions of war, although the great majority of the valid manhood of all countries entered active service we were successful in establishing on a grand scale the manufacture of the many and varied chemical products required for military purposes. One of the vast problems which the war has bequeathed to us is that of determining how the faculty which we exhibited in the manufacture of chemical products during a period of emergency is to be diverted and utilized for peace purposes, and for meeting the normal requirements of the world's commerce.

German and British Chemical Technology Compared.

The problem is an entirely novel one in that it is accompanied by certain factors which were previously absent or which were at any rate of subsidiary importance. Thus, it cannot be doubted that the bonds uniting all parts of the British Empire have become far stronger in consequence of the events of recent years; further, we realize to a greater extent than ever before that for purposes of production our Empire must be, if not absolutely self-contained, at least in possession of modes which could be rapidly mobilized so as to render us self-contained. Before the war, we were dependent on Germany for bromine and for coal-tar colors and upon the Dutch colonies for quinine; the price of these and other essential products quickly rose to famine prices

although no reason exists why they should not be produced within the Empire just as conveniently and just as cheaply as abroad. So completely has the necessity for a British production of great numbers of chemical products been brought home, even to the man in the street, that action has been taken in order to remove the former disabilities; the extent to which success has attended these efforts is open to comment, but it is at least certain that if we ever again find ourselves in a position of embarrassment owing to the absence of British sources of supply of essential chemical products, our political leaders will have to exhibit considerable agility in shifting the blame on to other shoulders than their own. All the bromine we require could be obtained as a result of the introduction of rational chemical methods into the production of salt from sea-water in India; all the quinine required could be furnished cheaply by the scientific cultivation of cinchona in our colonies; and the British production of complex organic explosive materials during the war has entirely swept away the ancient propagandist doctrine that the manufacture of fine organic chemicals, including coal-tar dyestuffs, is incompatible with the British temperament. All these are matters of great importance; but one further consideration has become accentuated during recent years, and accentuated by the fact that the major portions of the tropical regions of the world are administered by the English-speaking and the Latin nations. In the past we have, I venture to think, endeavored to build up our chemical industries far too much on the lines which proved so fruitful in Germany. I am speaking now not of the heavy chemical industry, in which we have always been to the fore, but of those industries which involve the production or the use of a great variety of more or less complex compounds. The organic chemist has long had before him, as one great object of his work, the artificial production of the myriads of organic compounds which we find amongst animal and vegetable products; he may be justly proud of his achievements in this direction and the success attained justifies our belief that we shall within quite a short time be able to prepare in the laboratory any compound substance formed by the animal or plant. Immediately some important natural product of commercial value is produced in the laboratory, the German technologist has sought to convert the laboratory method into a works process capable of competing with that of the plant or animal. From the standpoint of the German economist this course of action was sound; Germany had but few colonies and those few, since the German Government did not possess the art of colonial administration, were a source of considerable expense to the fatherland. We have relieved Germany of this expense and have probably thereby given a stimulus to the German instinct for making in a chemical works those chemical products given to us by tropical nature.

My point in suggesting that we have erred in adopting German views concerning the methods and aims of chemical technology, without reflecting that economic conditions in Central Europe are entirely different from those which prevail in the British Empire regarded as a whole, perhaps calls for some explanation; the necessary elucidation may be furnished by considering the ultimate object of technical chemical effort. The object of all technology consists in converting raw materials of inorganic or organic origin into products of greater value by expending upon them a certain amount of labor and a certain amount of energy. To a Central European nation labor means high wages to its population and energy means mainly coal or water-power; only one type of technological process is thus in the main to be considered, and this is one in which certain raw materials enter the works to be handled by costly labor and to be treated by the burning of fuel, which is another form of costly labor.

We have other methods for obtaining similar results, methods which are available in many cases but have been worked out in only a few cases. Let us consider one specific example. During the war, Germany was successful in producing India rubber in her chemical works; as converting into a works process the method for the polymerization of a hydrocarbon of low molecular weight to give rubber, discovered as a laboratory operation by Tilden and Bouchardat some generations ago, this was a fine achievement, but there is no doubt that the costs of production were high. When we consider, however, that many of the rubber plantations are in British territory, that curtailment of output has been necessary to keep last year's production down to about 350,000 tons, all the world could absorb, and that the cost of production was in the neighborhood of 25 cents per pound, it will be realized that the British Empire has a technical method for producing rubber which is a far sounder business proposition than the German synthetic processes. Our raw materials result from rubber plantations, the establishment of which is not costly, the labor employed is cheap tropical labor and the energy utilized is that of the sun's heat, which does not require to be mined and transported on railway trucks. Since the world's annual consumption of rubber will certainly increase rapidly and since our rubber plantations can already produce more than the world's present requirements, it is clear that we are in possession of a process for making India rubber, using cheap labor and gratuitous energy, which if conducted on scientific lines will always defy competition from the chemical works of Central Europe.

Synthetic Methods of Manufacturing Complex Natural Products Should Not be Over-done.

It would not be fair to deprecate the installation of synthetic methods for manufacturing complex natural products. Nature in general furnishes us with but one very complex member of any particular class of organic compounds. Thus, the numerous plants which produce indigo yield but minute proportions of other compounds of a similar type and, in this instance, the chemical technologist has succeeded in manufacturing a whole range of valuable dyestuffs of the indigo family which do not occur among vegetable products; his efforts have to this extent been amply justified, but it is difficult to believe that synthetic indigo itself would ever have been able to compete in the market if a similar amount of scientific skill and intelligence had been devoted to the improvement of the cultivation and utilization of the indigo plant. The work which is now being done by Armstrong, Davis, and others on natural indigo may well result in the re-establishment of the India indigo plantations which many decades ago brought such a substantial contribution to the financial prosperity of our Empire.

Other similar examples are available. During the Russo-Japanese war large quantities of camphor were manufactured in the German chemical works, but this production was killed so soon as the Japanese camphor laurel started to produce after the war.

The wider recognition of the fact that chemical technology largely neglects what perhaps should be regarded

as its most important mode of operation may, at no distant time, be forced upon us as an entirely economic necessity. The densely populated temperate regions of our globe will demand for their consumption and dissipation ever increasing quantities of energy, and the sources of energy in those regions—coal, oil, water-power, etc.—are diminshing rapidly. We shall be forced to get up a scheme for transporting to our northern countries the energy so lavishly sent from the sun to tropical lands. It is by no means impossible that the day may soon come when vegetable oils, produced in the tropics, will be brought northwards for use as an economical form of fuel. With these considerations in view, it seems time for our chemical technologists to devote more attention than they have hitherto to practicable methods for utilizing the surplus energy of the tropics in supplementing the waning supplies of energy available in colder climates.

Increasing Importance of Biochemical Study, and Production Methods Based Thereon

Another aspect of this question forces itself upon us. The last century has witnessed two great phases in the development of practical chemical work. Roughly speaking, it may be said that the progress of chemistry up to about forty years ago, great though that progress was, resulted from the application of rather fierce methods; a time came, however, when it was recognized that much was to be learned, especially in organic chemistry, by the study of delicately balanced reactions in which the practical methods applied were devoid of violence and in which conditions, such as concentrations, temperatures, and the like were carefully controlled. The organic chemistry of to-day does not distill fragile organic compounds through red-hot tubes; it proceeds by more subtle methods which, nevertheless, have greatly developed the broad knowledge of the science bequeathed to us by our predecessors. In its adoption of milder modes of operating and its consequent application of energy at a low potential, organic chemistry is approximating in its laboratory methods to those which occur in plants and animals; but the chemical changes which occur during the course of animal or vegetable life are still far more complex than those brought about in the laboratory. This complexity doubtless arises from the utilization of low potential energy in the living organism; temperature changes of more than one degree Centigrade are not permissible in the healthy animal organism. The great majority of the chemical reactions which take place in living matter occur catalytically in colloidal media.

While the first great epoch in the history of organic chemistry was marked by the application of violent experimental methods, the second developed milder modes of procedure; the third epoch, which is in course of inauguration, will bring us into direct competition with the experimental chemical methods practised by living matter. It is impossible to doubt that a vast expansion of organic chemistry will be witnessed by many of us, an expansion which will result from an imitation of the gently effected chemical operations carried out in the animal and vegetable creation.

Whilst this prophecy is not a mere surmise as to the nature of the next step forward to be taken by the science of organic chemistry, but is rather of the nature of a logical deduction from past events, it is perhaps surprising that more use has not been made of the chemical methods of living matter for technological purposes. On a technical scale, the activities of living organisms have been harnessed in the production of alcohol, acetone, glycerol and acetic and citric acids from sugars, and the pathologist has been wonderfully successful in directing similar activities towards the rectification of abnormal vital processes; much has also been done in the bacterial treatment of sewage and the separation thereby of valuable plant food-stuffs from the very dilute solution in which these occur in effluents. When the immense variety of chemical operations performed by living material are considered, it must be concluded that the manufacturing processes just mentioned, important though they are, are but a minute fraction of those which could be economically applied to the production of useful organic compounds if the scientific study of the subject had been sufficiently developed.

This subject would seem to be of particular importance to the development of chemical technology in the British Empire, which includes within its domain every range of climate and every species of animal and vegetable life. If we were able to establish an organization for the study of methods and processes for the manufacture by biochemical agencies of useful chemical products we should reap a rich harvest.

The Combatting of Tropical and Other Diseases.

Apart from questions of the desirability of plant culture for the purpose of increasing the yield of valuable products and the study of biochemical methods for manufacturing necessary chemical substances, both of which are of vital interest to us, although perhaps of more purely academic interest to other nations, another problem presents itself to us. A wide expanse of Empire brings with it exposure to a great variety of different types of parasitic life; these may be merely vegetable pests, like the prickly pear which is giving so much trouble in North Australia, or they may be such as cause diseases which render European life precarious in certain regions. The chemical technologist of to-morrow will need protection in the shape of methods for combatting these ills, and up to the present far too little progress has been made in this direction. It is true that the prickly pear is destroyed by spraying with arsenic chloride; but this is a mass treatment which is expensive, dangerous and only locally effective. It is true also that great success has been attained in the prevention or eradication of tropical diseases by inoculation with serum or by the injection of chemical materials. But notwithstanding the progress which has been made in these directions the whole subject involved is but in its infancy; and although British institutions for the study of tropical diseases and of parasitic plants have contributed much, in comparison with their means, it cannot be denied that Germany has also done splendid service by the study in its state-supported institutions of the very vital problems which arise. This source of scientific help will not be available in the future; it cannot be expected that a nation which only retains an academic interest in ills which no longer affect its own economy will preserve an active interest in fighting these tropical plagues. That the question is an urgent one—one which should interest our great manufacturers and merchants—finds illustration in the fact that over 90 per cent. of the inhabitants of the Fiji Islands and of Malaya are infected with hookworm; it would be difficult to estimate the extent to which production is limited by this plague in regions which are among the most fertile in the world.

Crude Petroleums—A Field for Research and Study.

All the foregoing are questions which will necessarily become urgent at some no distant date, and most of them will call for the breaking of more or less new ground by the chemical technologist. Of others which seem to have

been long ripe for study I may mention one. Although we are in possession of very complete knowledge of the constituents of coal-tar, a very common raw material, and have developed an elaborately detailed scheme for utilizing those constituents in the manufacture of valuable chemical products, no real effort has yet been made to deal in a similar manner with crude petroleums. It is common knowledge that crude petroleums are very complex mixtures of organic substances, just as is coal-tar, and also that a great variety of mineral oils are available in large quantities, each quite different from the others in the chemical nature of the hydrocarbons of which it mainly consists. No systematic attempt has yet been made to classify the various petroleums according to their chemical character, to separate from them pure chemical compounds and to endeavor to utilize these in the chemical industries. So far as petroleum is concerned our present attitude resembles that which we maintained a century ago towards coal-tar; it is regarded as only fit to burn. A vast field of chemical activity lies before us in the scientific study of petroleums and in the device of processes for utilizing the valuable individual compounds which they certainly contain in the expansion of chemical industries.

I have ventured to lay before you to-day a few thoughts concerning the manner in which the changed conditions of the world are likely to influence the future trend of development of chemical technology. Since no one can doubt that conditions are changed, I presume that all will agree that chemical industries, which depend upon these conditions, will also change. For this reason I offer no apology for having directed your attention for a few minutes to the very large issues which necessarily arise: my own views may be erroneous, but their expression may be useful in emphasizing the urgent need that our leaders in industry and chemical technology should reflect upon the whole subject and formulate sound views as to the development of the organic chemical industries of the British Empire.

Annual Meeting of the Canadian Institute of Chemistry

THE Annual Meeting of the Canadian Institute of Chemistry was held Monday, August 29th, at the Windsor Hotel, Montreal. The secretary, Mr. H. J. Roast, reported a successful year and announced that the Institute had secured its Dominion charter, and was thus the first and only corporate body of chemists organized under the laws of Canada. The membership had shown considerable increase, particularly among associates, and at the general meeting, representative chemists from Manitoba and the Eastern Provinces discussed the possible basis upon which members of the Manitoba Chemical Society and Maritime Chemists' Association might join. The feeling was that the Institute would be well pleased to establish branches at these and other points, and that most of the members would be qualified to join either as Fellows, Associates, or Students. The qualifications for membership will not be lowered, as the objects of the Institute were professional in their nature.

The question of engineering legislation received most serious and thorough discussion. The position in which chemists find themselves is not ideal, and the Institute did not take action either way as far as the movement in Ontario was concerned.

The Secretary pointed out that the action of the Council

A group of Members of the Canadian Institute of Chemistry in Attendance at the Annual Meeting, Montreal, August 29th, 1921.

in postponing an election of officers until the incorporation was through, had been the result of legal advice. As the incorporation was completed but a few days before the annual meeting, it was impossible to secure a vote previous to that date, and it was decided to continue the life of the old council until the next annual meeting in May, 1922. This meeting will be held in Ottawa. Sir William Pope was elected an Honorary Fellow.

For the first time the Institute held a dinner which in future will be an annual affair. Prof. J. W. Bain, President, was in the chair, and a fine series of five minute addresses were made. Dr. C. A. Herty stated that he followed the development of the Canadian Institute with the greatest interest, as he had been present at meetings at Toronto. Among those who spoke were H. J. Roast, Dr. Bigelow, Dr. Donald, Dr. A. C. Neish, Dr. A. T. Charron, Dr. Lehmann, Dr. F. T. Shutt. Mr. Merlin Davies brought warm applause with his songs, which were greatly appreciated by those present.

Following the dinner, Dr. Georges Baril, who represented the Institute in Belgium last summer at the International Meeting, gave a review of that convention, and pointed out the position Canada was taking by having direct representatives. Following this Dr. H. Davis of the Mellon Institute, gave a most interesting paper on modern methods in the production of sulphur. Films of the process were loaned by the Texas Gulf Co. Dr. Davis is a Canadian who has been doing research work on sulphur and sulphur deposits.

The Institute is demonstrating its usefulness as a Canadian institution, and the interest in the meetings indicates that from now on it will take its place, not only as a leading Chemical Society in Canada, but in international chemical affairs.

NOTE—The official report of the Institute Secretary will appear in our November issue.

SIR WILLIAM POPE ADDRESSES MONTREAL ROTARIANS.

On Tuesday, August 30th, while the annual meeting of the Society of Chemical Industry was on in Montreal, Sir William Pope was the guest of honor at the luncheon of the Rotary Club of Montreal. Professor J. Watson Bain, Captain C. J. Goodwin and H. J. Roast, secretary of the Canadian Institute of Chemistry, were also present as guests

Sir William Pope gave an interesting address on poison gas in warfare to the Rotarians, speaking along the lines of his article on "The Case for Chemical Warfare" in our July issue

LARGE MARITIME HYDRO-ELECTRIC PLANT COMPLETED.

The largest hydro-electric plant in the Maritime Provinces has just been completed at the works of the Bathurst Lumber Company at the Nepisquit Falls in Restigouche County, Nova Scotia. Work was begun in May, 1919, and the plant has been completed at a cost of $1,750,000. Provision has been made for three generators and two have been installed, but at present only one, with a capacity of 4,500 horsepower, will be used. The Bathurst Lumber Company will use about 2,500 horsepower for its own plants; another 1,000 horsepower will be used by the Newcastle and Dominion pulp mills, leaving a margin of 1,000 horsepower for other demands.

"THE ENGINEER."

Sung at dinner to the visiting members of The Society of Chemical Industry, Buffalo, N.Y., Sept. 5, 1921.

Who is the man designs our pumps with judgment, skill and care?
Who is the man that builds 'em and who keeps them in repair?
Who has to shut them down because the valve seats disappear?
The bearing-wearing, gearing-tearing mechanical engineer:

Who buys his juice for half a cent and wants to charge a dime?
Who when we've signed the contract can't deliver half the time?
Who thinks a loss of twenty-six per cent. is nothing queer?
The volt-inducing, load reducing electrical engineer:

Who is it takes a transit out to find a sewer to tap?
Who then with care extreme locates the junction on the map?
Who is it goes to dig it up and finds it nowhere near?
The mud-bespattered, torn and tattered civil engineer:

Who thinks without his products we would all be in the lurch?
Who has a heathen idol which he designates Research?
Who tints the creeks, perfumes the air, and makes the landscape drear?
The stink-evolving, grass-dissolving chemical engineer:

Who is the man who'll draw a plan for everything you desire
From a trans-Atlantic liner to a hairpin made of wire?
With "ifs" and "ans," "howe'ers" and "buts" who makes his meaning clear?
The work-disdaining, fee-retaining consulting engineer:

Who builds a road for fifty years that disappears in two?
Then changes his identity, so no one's left to sue?
Who covers all the traveled roads with filthy oily smear?
The bump-providing, rough-on-riding highway engineer:

Who takes the pleasure out of life and makes existence hell?
Who'll fire a real good-looking one because she cannot spell?
Who substitutes a dictaphone for coral-tinted ear?
The penny-chasing, dollar-wasting efficiency engineer.

We are indebted to Mr. R. C. Boggess, of the Sowers Manufacturing Co., Buffalo, for obtaining this copy. He advises us that it is the product of collaboration at a meeting of some half dozen choice spirits, suggesting a maximum of five men.

Stewart Moore, a Winnipeg prospector, has re-discovered a rich deposit of mica in the district adjacent to Point du Bois, and staked a fifty-two acre claim. The mica is traceable for fifteen hundred feet in length and several large blocks have already been taken out. A small crew is now working on the deposit.

The Canadian Department of Naval Affairs has in view the installation of a very powerful continuous wave system wireless station near Vancouver to undertake land work and communicate with distant points up coast, thus leaving the present station at Point Grey to handle shipping business only.

The Sulphur Industry of Today†

Description of Texas Gulf Deposits---Historic Work of Frasch---Development of the Industry---New Uses for Sulphur.

By HAROLD S. DAVIS*

SULPHUR is one of the few elements occurring free in nature and its annual consumption now reaches millions of tons. Sulphur makes up slightly over a tenth of one per cent. of the first ten miles of the earth's crust. This, of course, corresponds to a great quantity of sulphur, about two million cubic miles. Most of this sulphur occurs in the combined state, in the igneous rocks. Its compounds are also widely disseminated through the sedimentary rocks and are found, where their presence would be well dispensed with, in coal and petroleum. Viewed from the standpoint of the total quantity, the proportion of sulphur which occurs native is very small but considered in tons the beds are enormous. Among the largest are those in Italy and the Island of Sicily. For hundreds of years up to the present century Sicilian sulphur controlled the market, but today, due to the competition of American sulphur the Sicilian industry has shrunk to a fraction of its former proportions. It would be superfluous to deal with the nature of these deposits or the methods of mining employed, for these have been carefully described in books without number. It is worthy of note, however, that thousands of children are still employed in the Sicilian mines.[1]

At the present time the world's sulphur market is dominated by the American product. The deposits from which this comes occur in the so-called "salt domes" of the Gulf coastal plain. The term "salt dome" may bring up an erroneous conception as to their nature, for due to erosion the "dome" is practically all underground and its top scarcely rises above the surrounding surface. The visible elevation is generally from 10 to 15 feet, although the maximum goes as high as 80 feet. It is quite possible that the level plain conceals deposits of great value, but their discovery will necessarily be more or less accidental.

The Gulf Deposits.

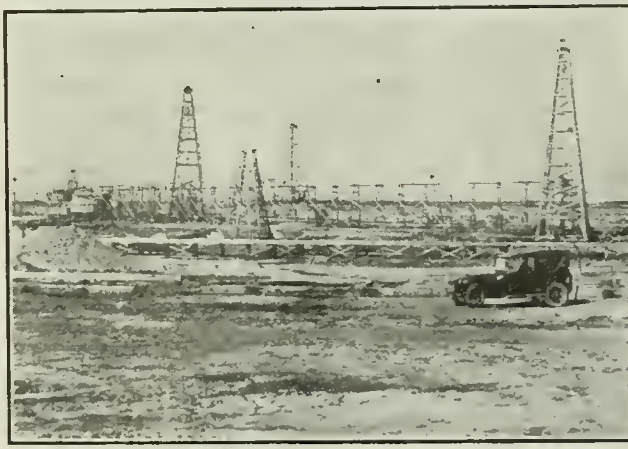
The upper strata of the dome are made up of unconsolidated sediments; beneath these lies the salt dome proper. Its upper portion consists of layers of limestone and gypsum, while beneath, a great salt bed extends downwards to unknown depths. The sulphur is found in the limestone zone, which is also the seat of the petroleum sometimes found here in immense quantities.

The origin of the deposits has not yet received its final interpretation. The domes are generally believed to have been caused by some igneous intrusion at great depths. It is pretty well established that the sulphur is a product of the oxidation of hydrogen sulphide and authorities generally agree that this hydrogen sulphide results from the reduction of gypsum. How this reduction has been brought about is not definitely settled although it is known that gypsum can be reduced by organic matter through the agency of heat or of certain bacteria.

The existence of the sulphur deposits was discovered about 40 years before they began to be successfully exploited. In the meantime many attempts were made to mine them by shaft methods, but all failed completely and caused considerable loss of life. The main difficulties encountered were due to the unconsolidated nature of some of the layers above the deposits (quicksands), the great water pressure, and the poisonous gases emitted.

Frasch Solves Sulphur Mining Problem.

About 1890, the engineer, Hermann Frasch, conceived the idea of melting the sulphur in the ground by means of superheated water and then pumping it to the surface in the fluid condition. Mr. Frasch had already met with notable successes in other fields, e.g., it was his process for removing sulphur from oils that made Canadian petroleum valuable. His new project met with little encouragement and many difficulties. One prominent man offered to eat every ounce of sulphur brought to the surface in this way. But Frasch had confidence in the scientific principles upon which his scheme was based and subsequent events have more than justified his faith. The first trial is best described in his own words taken from his adress of acceptance of the Perkin medal[2]: "After permitting the melting fluid to go into the ground for twenty-four hours, I decided



View of Derricks Holding Steam and Sulphur Casings.

that sufficient material must have been melted to produce some sulphur. The pumping engine was started on the sulphur line and the increasing strain against the engine showed that work was being done. More and more slowly went the engine, more steam was supplied until the man at the throttle sang out at the top of his voice, "She's pumping." A liquid appeared on the polished rod and when I wiped it off, I found my finger covered with sulphur. Within five minutes the receptacles under pressure were opened and a beautiful stream of the golden fluid shot into the barrels we had ready to receive the product. After pumping for about fifteen minutes the forty barrels we had supplied were seen to be inadequate. Quickly we threw up embankments and lined them with boards to receive the sulphur that was gushing forth....."

"....When everything had been finished, the sulphur all piled up in one heap, and the men had departed, I enjoyed by myself this demonstration of success. I mounted the sulphur pile and seated myself on the very top. It pleased

† Paper read at Annual Meeting, Canadian Institute of Chemistry, Montreal, August 29th, 1921.
*Industrial Fellow of the Mellon Institute of Industrial Research of the University of Pittsburgh, Pittsburgh, Pa.
[1]Eng. Mining J., 112, 138 (1921).

[2]J. Ind. Eng. Chem., 4, 134 (1912).

me to hear the slight noise made by the contraction of the warm sulphur, which was like a greeting from below—proof that my object had been accomplished. Many days and many years intervened before financial success was assured, but the first step towards the ultimate goal had been achieved. We had melted the mineral in the ground and brought it to the surface as a liquid. We had demonstrated that it could be done."

Frasch's Method Met With Severe Criticism.

Even after this initial success, comments in the technical world were very adverse. M. Ricardo Travaglia, an Italian engineer, and a recognized authority on sulphur, reported that the Sicilian mines had nothing to fear from the American product. Even as late as 1898 the following extract

Liquid Sulphur Being Deposited by Pipe Line.

appeared in "Mineral Industry": "In 1898 the conclusion was reached that the exploitation of the mines by the Frasch process was unprofitable. It is now conceded that this process is a complete commercial failure, and has greatly injured these deposits of sulphur, if it has not actually destroyed their value entirely, since their exploitation by shafts and regular underground mining is now fraught with danger, owing to the uncertain extent of the openings from which the sulphur has been dissolved by the Frasch experiments."[3]

Looking back in the light of twenty years' development, it is easy now to see that Frasch was right and all the rest wrong; but let us put ourselves in the place of his contemporaries. Let us consider that it is impossible to send the hot water underground at a temperature much above 160°C., the point at which sulphur becomes viscous, and that the minimum temperature at which the sulphur can be pumped to the surface and handled with safety is about 130°C. Further, that not only the sulphur but all the containing strata must be heated up and that the ways of underground water are devious. Keeping these facts in mind, would we have pronounced the process feasible or have placed any faith in the "American Humbug."

All these difficulties are real and in order to mine the deposits successfully by the Frasch process it is necessary to have abundant supplies of cheap fuel and to carry out the operations on a large scale so that the wastage of heat from the wells to the surrounding strata is kept proportionately low.

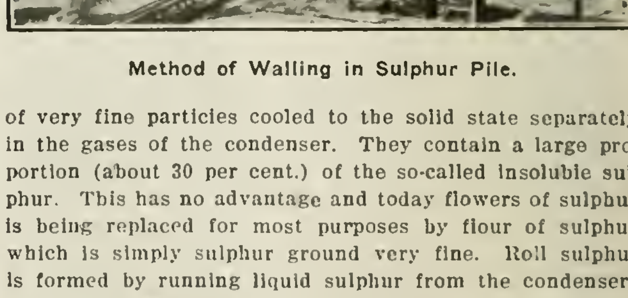
American Development.

The Frasch patents were acquired by the Union Sulphur Company, which developed the deposit in Calcasieu County, Louisiana. It is pleasing to remember that Mr. Frasch, whose daring genius first made these great sulphur beds available, acquired a large fortune from his interests in this company. The basic Frasch patents expired in 1908 and in 1912 another organization, the Freeport Sulphur Company, started operations on the "Bryan Heights" dome in Texas.

One of the largest, perhaps the largest, centralized deposit of sulphur in the world is that in the "Matagorda dome" in Texas. In 1918 the almost insatiable demand of the Federal Government for sulphuric acid and the belief that the sulphur industry is a basic and permanent one led to the formation of the Texas Gulf Sulphur Company which undertook to open up this deposit, using the superheated water method of mining. In spite of the exceptional difficulties attending any construction work at that time the plant was completed within nine months. Mining operations began on March 9th, 1919, and have been continuous ever since. The plant was designed to have a capacity of at least 1,000 tons a day, but the output can be forced to three or four times that amount, using the present equipment. At first sight this looks like bad designing, but the increase is rather to be attributed to a scientific study of the mining operations and the care with which they are checked. A large sized model of the deposit enables the engineers constantly to visualize what is taking place underground. Those who uphold the principle of the conservation of natural resources may feel assured that little of the sulphur in this vast deposit will be lost to industry.

The sulphur mined by the Frasch process has a degree of purity really extraordinary. Think of sulphur being pumped out of the ground 99 per cent. pure and sometimes, excluding moisture, running 99.9 per cent. There are very few C. P. chemicals purer than this. The United States Pharmacopoeia calls for only 99 per cent. purity in flowers of sulphur to be used for medicinal purposes.

However, this sulphur is a comparatively new product and the commercial world is thinking for the most part in terms of the various brands of Sicilian sulphur with which it has been familiar. Crude Sicilian sulphur contains 2-10 per cent. of impurities and for most purposes must be refined by distillation. This yields two products, flowers of sulphur and roll sulphur. Flowers of sulphur is composed



Method of Walling in Sulphur Pile.

of very fine particles cooled to the solid state separately in the gases of the condenser. They contain a large proportion (about 30 per cent.) of the so-called insoluble sulphur. This has no advantage and today flowers of sulphur is being replaced for most purposes by flour of sulphur which is simply sulphur ground very fine. Roll sulphur is formed by running liquid sulphur from the condensers into moulds and cooling.

Effects of Petroleum in Sulphur.

The sulphur of all three American companies contains minute traces of oil, and its presence occasionally leads the consumer to believe that the sulphur is fairly impure.

[3] Mineral Ind., vii., 643 (1898).

A very slight oil content, 0.1 per cent., shows itself by the color, the odor, and the peculiar burning properties of the sulphur. To illustrate: If two small samples of sulphur, one chemically pure, the other with 0.2 per cent. petroleum oil, are ignited, the former burns until entirely consumed. As the latter burns, a film gradually grows over the surface, extinguishing the flame as it spreads, until it has put it out entirely, leaving most of the sulphur unconsumed.

At first thought it seems strange that a combustible substance like petroleum should have this effect, but the explanation is quite simple. At a moderate temperature sulphur and oil interaction to form asphalt, which a higher temperature changes to carbon. In the burning of sulphur containing oil, such an interaction takes place and an asphaltic film forms over the surface, the ignition temperature of which is so much higher than that of sulphur that the flame is extinguished.

The remedy which naturally presents itself is that of breaking the asphaltic film, and burners of the rotary or cascade type, in which the surface of the sulphur is agitated, do this very successfully. Indeed, no trouble has been experienced with such burners when the oil content of the

Steam Shovel Working on Pile After Walls Have Been Removed.

sulphur runs as high as 0.2 per cent., which happens only exceptionally.

Now that the deposits have been opened up for some time, trouble from the oil content of the sulphur is no longer anticipated.

All the large deposits are near oil fields and it is assumed that when the hot water is first sent down into a deposit it carries the oil encountered in sand pockets to the sulphur beneath. As operations continue the enormous amount of water used washes the oil pretty well out, so that the sulphur pumped to the surface has an increasingly smaller oil content. The sulphur as it naturally exists contains no oil, as examination of the various drill cores reveals.

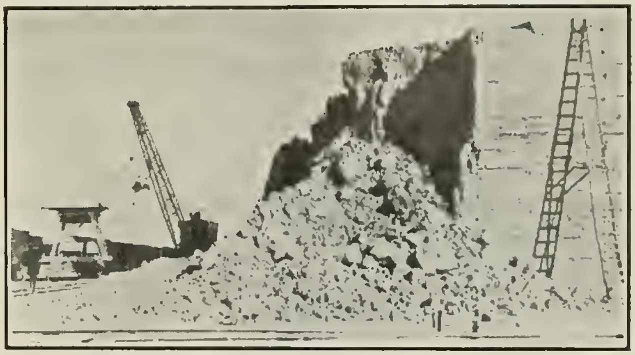
Future of Sulphur Industry and Research.

Compared with other commodities, sulphur is today cheaper than ever before in its history, and the market is likely to remain stable. This is due to the immense reserves in the American deposits and the fact that they are mined by well financed competing companies who keep large stocks on hand. The consumer can rest assured that sulphur will be readily available at a reasonable price for many years to come.

Unquestionably, the use of sulphur for purposes old and new will steadily increase. Realizing this, the Texas Gulf Sulphur Company, coincident with the beginning of its operations, inaugurated a systematic scientific research on sulphur. Broadly speaking, the work has meant a careful study of the substance itself, with the object of obtaining light on methods of mining, on the difficulties met by the consumer in handling sulphur and on possible new uses.

As might be expected, the extent of the literature on sulphur in every language is very great, and though the fact that it has been so long known may partially account for this, at the same time the remarkable chemical and physical properties of the element have ever inspired research.

Those properties which suggest certain possible tonnage uses for sulphur are its exceptional insulating qualities,



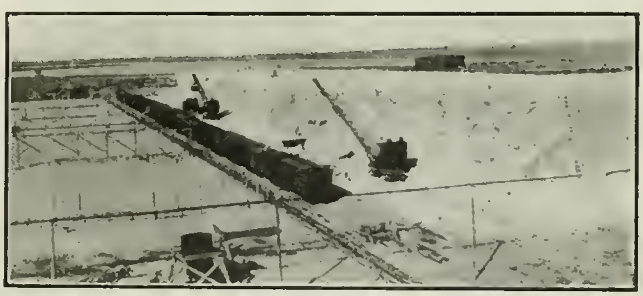
A Section of Pile Dynamited for Shovel Handling.

its resistance to being wetted by water, and its inertness towards most acids, all these combined with a fair degree of physical strength.

As a cement, either alone or combined with sand, sulphur has been successfully used for many purposes. For example, sulphur is now being used to set bricks in certain acid towers; paving bricks have been laid with sulphur to give entire satisfaction.

Perhaps the chief obstacle which has prevented a steady increase in the use of sulphur for such purposes has been the novelty of the art of melting sulphur. Melting in a large open dish is extremely unsatisfactory. Unless the mass is well stirred its temperature goes up and the sulphur becomes viscous and may even take fire. To obviate these difficulties a new type of melter has been developed at the Mellon Institute. The design is simple and has proved very efficient. A complete description will be published at an early date.

Once melted, the sulphur is easily kept so by steam-jacketed kettles under a pressure of about 30 pounds, and



Loading Cars With Sulphur.

can be transported long distances through pipes with a steam line in the centre.

Engineers are naturally and properly conservative about the introduction of new materials into construction work. Still, sulphur is about as easily handled as asphalt, so that when concrete and other familiar materials fail, they will do well to keep in mind this old familiar substance which is now so readily available.

List of Those in Attendance at 40th Annual Meeting, Society of Chemical Industry, Montreal, 1921

Acton, Leonard T., Acton Publishing Co., 545 King St. W., Toronto, Ont.

Adams, W. G., Gas Light and Coke Co., London, England.

Alliott, Eustace A., Director of Manlove Alliott & Co., Ltd., London, England.

Archambault, Victor, Laval and Montreal College, Montreal, Que.

Atack, Dr. Fred. W., British Alizarine Co., Manchester, England.

Adams, Charles, Adams Chemical Co., 27 St. Sacrement St., Montreal, Que.

Arnold, Fred W., Canadian Electric Steel, Montreal.

Ardagh, E. G. R., Professor Department of Applied Science, University of Toronto.

Alleman, Gellert, Professor Department of Chemistry, Swarthmore College, Swarthmore, Pa., U.S.A.

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Bradshaw, Lawrence, 50 East 41st St., New York, N.Y.

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Bell, Jerome B., Jr., Canadian Explosives, Ltd., 720 Transportation Bldg., Montreal, Que.

Ball, J. A., Chief Chemist, St. Laurence Sugar Refineries, Ltd., Montreal, Que.

Breithaupt, J. E., Breithaupt Leather Co., Kitchener, Ont.

Bain, J. Watson, Professor, Department of Applied Science, University of Toronto, Toronto, Ont.

Barber, Dr. J. T., The Central Laboratory Co., Ltd., Widners, England.

Broijoin, Louis, Professor, Department of Chemistry, University of Montreal.

Benham, Keith, Man. Director, Universal Grinding Machine Co., Ltd., Stefford, England.

Bates, John S., Technical Superintendent, Bathurst Co., Ltd., Bathurst, N.B.

Baril, Dr., Georges, Professor, Department of Chemistry, Universite de Montreal, Montreal, Que.

Bigelow, Dr. H. E., Professor, Department of Chemistry, Sackville, N.B.

Brennen, Herbert J., Standard Chemical Co., Ltd., Montreal, Que.

Bartram, V. G., Sales Manager, Canadian Electro Products Co., Ltd., Montreal, Que.

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Barber, Mrs. J. T., "Ormsby," West Kirby, England.

Bardorf, Mrs. C. F., 439 Mount Pleasant Ave., Montreal, Quebec.

Copping, Allan B., 504 Lansdowne Ave., Westmount, Que.

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Charron, Dr., A. T., Provincial Laboratory, St. Hyacinthe, Que.

Cordy, H. J., Chemist, Nichols Chemical Co., Capelton, Que.

Couture-Papineau, A., Department of Health, Ottawa, Ont.

Cook, S. J., Dominion Bureau of Statistics, Ottawa, Ont.

Collitt, Bernard, Sheaf Iron Works, Lincoln, England (Chief Chemist, Ruston and Hornsby, Ltd.)

Cornell, F. E., F. E. Cornell and Co., Ltd., Montreal, Que.

Crossley, T Linsey, Editor, "Canadian Chemistry and Metallurgy," Toronto, Ont.

Clayton, R. H., Manager, Oxide Co., Manchester, England.

Crowe, Cyril H., Stewiacke, N.S.

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Davies, M. L., Vice-President Standard Chemical Co., Toronto, Ont.

Denis, Theo. C., Director, Mines Branch, Province of Quebec, Quebec, Que.

Donald, J T., J. T. Donald and Co., Ltd., Montreal, Que.

Donald, J. R., J. T. Donald and Co., Ltd., Montreal, Que.

Dickson, W P., Superintendent Color Works, McArthur-Irwin, Ltd., Montreal, Que.

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Donald, Miss, Montreal.

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Gibson, A. L., Professor of Dairy Chemistry, Ontario Agricultural College, Guelph, Ont.

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Gilmore, Ross E., Chief Chemist, Standard Chemical Co., Montreal.

Gamble, Frederic W., Director, Allen & Hanburys, Ltd., London, England.

Gamble, Mrs. F. W., London, England.

Goodwin, C. J,. Captain, Oscar Goodwin & Sons, London, England.

Gribble, W. M., Standard Chemical Co., Ltd., Montreal, Que.

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Herty, Chas. H., Editor, Journal of Industrial & Engineering Chemistry, New York, N.Y.
Hannen, Scott, J. T. Donald & Co., Ltd., Montreal, Que.
Hazen, Chas. R., Milton Hersey Co., Ltd., Montreal, Que.
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Horner, F. W., Frank W. Horner, Ltd., 317 Roslyn Ave., Montreal, Que.
Hutton, O. A., Standard Chemical Co., Ltd., Montreal, Que.
Hayden, J. E., J. E. Hayden & Co., Montreal, Que.
Heaf, W., The Ranice Co., Bradbury, England.
Hambly, F. J., Manager, Electric Reduction Co., Buckingham, Que.
Henkey, M., Forest Products Laboratories, Montreal.
Holland, Norman, Holland Paint and Varnish Co., Montreal, Que.
Hovey, W. C., Canadian Electro Products Co., Shawinigan Falls, Que.
Herzberg, Otta W., 348 Kingston Ave., Montreal, Que.
Holland, G. A., Winn and Holland, Ltd., Montreal.
Hersey, Milton L., President, Milton Hersey Co., Ltd., Montreal.
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Hoult, J. L., Sales Manager, Standard Chemical Co., Montreal, Que.
Hemmingway, Mrs. Frank, Cleveland, Ohio.
Hambly, Mrs. Fred., Buckingham, Que.
Hazen, Mrs. C. R., Westmount, Que.
Job, Robert, Vice-President, Milton Hersey Co., Montreal.
Johnson, F., McGill University, Montreal.
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Johnson, E. J., Dominion Cartridge Co., Montreal.
Jarrell, J. O., The Hughes Owens Co., Montreal.
Josephson, Edgar, Pantasote Leather Co., Passaic, N.J.
Jordon, Louis A. (England).
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Kirkland, C. G., Standard Chemical Co., Montreal, Que.
Kerr, Peter, Shell-Mex, Ltd., Shell-Haven, Essex (England).
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Krug, Stanley J., Canadian Consolidated Rubber Co., Montreal.
Larose, Paul, Northern Electric Co., Ltd., Montreal.
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Lang, Colonel W. R., Director of Military Studies, University of Toronto.
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LeGood, P., Advertising Mgr. Journal of Society of Chemical Industry, London, Eng.
Lennox, P., Hughes Owens Co., Montreal, Que.
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Lindberg, N., Chemical Engineer, Stockholme, Sweden.
Lees, Frank, Textile Chemist, Watertown, Mass.
Lehmann, A., Professor of Chemistry, University of Alberta. Edmonton.
Lester, Charles, Milton Hersey Ltd., Montreal.
Logan, J. F., McGill University.
Leverin, Mrs., Ottawa.
Lyman, Arthur, Lymans Ltd., Montreal.
Leverin, H. A., Department of Mines, Ottawa.
MacIntosh, George, Marx and Rawolle, Ltd., Montreal.
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MacRae, H. E., Patent Examiner, Patent Office, Ottawa.
McGill, Dr. A., Chief Public Analyst, Ottawa.
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Matheson, Mrs. H. W., Montreal.
Matheson, H. W., Vice-President Canadian Electro Products Co., Ltd., Montreal.
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Maas, O., McGill University.
Mace, W. E., 107 St. James St., Montreal.
McLeod, C. K., Phoenix Bridge & Iron Works, Montreal.
McIntyre, Geo. D., Jas. W. Pyke & Co., Ltd., Montreal.
Macauley, J. R., J. T. Donald & Co., Montreal.
McCrady, MacHarvey, Board of Health, Montreal
Margrett, A. A., Standard Chemical Co., Montreal.
Moore, Ernest V., Engineer for Ontario Government Peat Committee.
Morgan, Thos. M., 370 Wood Ave., Westmount, P.Q.
Mees, C. E. K., Eastman Kodak Co., Rochester, N.Y.
Mackie, Mrs. I. C., Sydney, N.S.
Mackie, I. C., Dominion Iron & Steel Co., Sydney, N.S.
McCarthy, J. B., Assistant Professor of Chemistry, MacDonald College, Que.
Nichols, Wm. H., Dr., President Allied Chemical & Dye Corporation, 61 Broadway, New York, N.Y.
Nasmith, Mungo E., Superintendent Commercial Solvents Corp., Terre Haute, Ind., U.S.A.
Newton, Sherley, Chief Chemist Sherwin-Williams Co., Montreal.
Nieghorn, A., Nichols Chemical Co., Toronto and Montreal.
Neish, Arthur C., Professor in Charge, Department of Chemistry, Queens University, Kingston.
Nadeau Hervie, Laboratoire Nadeau Linn, 29 St. Vincent St., Montreal.

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Nieghorn, Mrs. A., 631 Roslyn Ave., Montreal.
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Patterson, A. L., Student McGill University, Montreal.
Proudfoot, D. G., 2439 St. Urbain St., Montreal.
Prescott, Walker F., Sherwin-Williams Co., Montreal.
Pope, E. T., Charlton E. Pope, 180 St. James St., Montreal.
Pandya, K. C., Professor, Agra, India.
Pope, Sir William.
Pert, A. E., Official Stenographer.
Power, F. B., Bureau of Chemistry, Washington, D.C.
Price-Green, C., Commissioner, Department of Resources, Canadian National Railways, Toronto.
Parks, A. Stuart, Standard Chemical Co., Montreal.
Reid, James, R. Craig & Sons, Paper Mills, Caldercruix, Scotland.
Rothwell, H. E., Harris Abattoir Co., Ltd., Toronto.
Ramieux, C. F., Shawinigan Laboratories, Ltd., Shawinigan Falls.
Robertson, H. R., 35 St. Mark St., Montreal.
Reilly, H. E., Associate Professor, McGill University.
Ridgewell, Ernest P., McGill University.
Roast, Harold R., Consulting Metallurgist, Secretary Canadian Institute of Chemistry, 393 Guy St., Montreal.
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Reynolds, C. W., The Canada Paint Co., Montreal.
Roast, Mrs. Harold J., Montreal.
Roast, Miss Edith, Montreal.
Roast, Mrs. M. E., Montreal.
Roast, Miss Winnifred, Montreal.
Reid, Miss Ruby, Dundee, Scotland.
Ruttan, R. L., Dr., Professor of Chemistry, McGill University.
Saunders, L. E., Norton Co., Worcester, Mass.
Snell, J F., Professor of Chemistry, MacDonald College, Que.
Shipley, J. W., Assistant Professor of Chemistry, University of Manitoba, Winnipeg, Man.
Stokes, Wm. B., Forest Products Laboratory of Canada, Montreal.
Sneddon, Richard, Chemist, Dominion Flour Mills Co., Montreal.
Spencer, A. Gordon, 73 Chesterfield Ave., Westmount, Que.
Stehle, Raymond L., Assistant Prof. of Pharmacology, McGill University.
Shutt, Frank T. Dr., Dominion Chemist, Experimental Farm, Ottawa, Canada.
Saul, Bernard B., Montreal Light, Heat & Power Co., Montreal.
Shaw, T. P., Domonstrator, Dept. of Chemistry, McGill University.
Skirrow, F. W. Dr., Chief Chemist Shawinigan Laboratories, Ltd., Shawinigan Falls, Que.
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Stephenson, J. N., Editor "Pulp and Paper Magazine," Gardenvale, Que.
Swan, C. A., Antoine Chiris Co., New York, N.Y.
Smith, E. A., Chemist, Standard Chemical Co., Montreal
Stansfield, Alfred, Dr., McGill University.
Saxe, Joel B., Sect. Milton Hersey Co., Ltd., Montreal.
Shaw, A. Norman, Assoc. Prof. of Physics, McGill University.
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Simpson, Geo. E., Dept. of Biochemistry, McGill University.
Sterne, E. T., G. F. Sterne & Sons, Ltd., Brantford, Ont.
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Scott, Miss, Montreal.
Smith, Edgar F., President of the American Chemical Society.
Smith, Mrs. Edgar F., University of Pennsylvania.
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Taggart, Mrs. Walter, University of Pennsylvania.
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Tomlinson, Geo. H., Chemical Engineer, Hawksbury, Ont.
Taylor, I. S., Demonstrator, MacDonald Physics Bldg.
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Vargas, Vergara, T. M., Professor of Chemistry, Carrera 8a, No. 303 Bogota, Columbia, S.A.
Viens, E., Director of Laboratory, Department of Public Works, Ottawa.
Vinch, Eugene, Shawinigan Water & Power Co., Montreal
Verity, Ben., American Printing Co., Fall River, Mass.
Vargas Vergor, Mrs. J., Bogota, Columbia.
Woodland, Mrs., Montreal.
Woodland, Gladys Miss, Montreal.
Woodland, Walter B., Chemist, 24 Craig St.
Wales, J. A., Chemist, Standard Chemical Co., Montreal.
Winsborrow, E. C., Chemist, 320 Lagouchetiere St. W., Montreal.
Wardleworth, T. H., National Drug & Chemical Co., Montreal.
Wheatley, A. C., Instructor, Dept. of Chemistry, Ontario Agricultural College, Guelph, Ont.
Williams S. H., The J. B. Williams Co., Glastonbury, Conn., U.S.A.
Wheeler, A. S., University of North Carolina.
Whitby, G. Stafford, Dr., Dept. of Chemistry, McGill University.
Wilson, R. S., Dental Laboratory, 359 Richmond St., London, Ont.
Wiegand, W. B., Director of Manufacturing, Ames Holden Macready, Ltd., Montreal.
Wells, Edward E., John Cowan Chemical Co., 9 Dalhousie St., Montreal
Waddell, John, Professor of Chemistry, Queens' University, Kingston, Ont.
Wheeler, N. E., Professor of Physics, Colby College, Waterville, Mo.
Westman, L. E., "Canadian Chemistry & Metallurgy," Toronto.
Wheeler, Mrs. A. S., Chapell Hill, N. C., U.S.A.
Wardleworth, Mrs. T. H., Westmount, Que.
Young, E. G., Associate Professor of Chemistry, Western University, London, Ont.
Yeomans, W. W., Chemist, Montreal Abattoir Co., Ltd., Montreal Que.

It is reported that a vein of Albertite coal seven inches in width has been discovered within two miles of the famous old Albertite Mine in Albert County, New Brunswick. The vein was struck 122 feet underground.

Chemical Society News

MARITIME CHEMISTS HOLD ANNUAL MEETING.

The annual meeting of the Maritime Chemists' Association was held at Truro, N.S., August 5th, 1921. The president, Dr. H. E. Bigelow, of Mount Allison University, Sackville, presided at the morning session, which was held at the College of Agriculture. Dr. Bigelow reported on the year's work. New officers were elected as follows:

President—Prof. L. C. Harlow, of the College of Agriculture, Truro.

First Vice-President—C. E. Wallin, Sydney, superintendent of the Coke Ovens of the Dominion Iron and Steel Company.

Second Vice-President—A. F. Blake, assistant superintendent of the Atlantic Sugar Refinery, St. John.

Secretary-Treasurer—Dr. D. U. Hill, Professor of Chemistry at Acadia University, Wolfville.

Members of Executive—C. C. Forward, of the Trade and Commerce Laboratory, Halifax; Professor H. E. Bigelow, Mount Allison University, Sackville.

Professor Bigelow outlined the present position and purposes of the Canadian Institute of Chemistry. It was voted to invite the teachers of chemistry in the schools and colleges of the Maritime Provinces to join the association at the annual meeting next summer, when the matter of teaching chemistry will receive extended attention.

At noon luncheon was prepared under the direction of Miss Helen J. McDougall, superintendent of Women's Institutes for Nova Scotia. It was served at the Science building.

Following the luncheon there were addresses by Prof. L. C. Harlow and Dr. Melville Cumming, secretary for agriculture. Dr. Cumming showed the members over the college farm, after which they visited the milk condensing plant of the Borden Company, Limited.

The afternoon session was held at the Provincial Normal College. A paper was read by Prof. H. J. M. Creighton, of Swarthmore, Pennsylvania, formerly of Dalhousie University, on the subject of "Electrolytic Waterproofing of Textile Fabrics."

A. Kesall, of the Dominion Entomological Laboratory, Annapolis Royal, read a paper on "Common Insecticides and Fungicides in use in the Maritime Provinces."

In the absence of H. J. Vickery, who is at Yale University, his paper was read by Prof. Bigelow. It was entitled "The Hydrogen Ion Concentration in a Solution of Gliadin During Hydrolysis of the Amid Nitrogen."

Mr. Vickery was at one time on the staff of the Provincial Normal College and previously with Dalhousie University. He is now studying at Yale.

The proposed picnic at Victoria Park was cancelled. There was an illustrated public lecture entitled "The Wonders in a Lump of Coal," given at the Normal College, by Kenneth L. Dawson, assistant superintendent of the gas department of the Nova Scotia Tramways and Power Company, Halifax.

The ladies were given a motor drive to points of interest.

Those who were present at the sessions were: Prof. H. E. Bigelow, Sackville; Prof. H. G. M. Creighton, Swarthmore, Pennsylvania; C. C. Forward, Halifax; K. L. Dawson, Halifax; P. Dimmit, Halifax; C. E. Wallin, Sydney; H. I. Knowles, St. John; A. Kelsall, Annapolis; Prof. L. C. Harlow, Truro; W. DeLong, Truro; G. E. Myers, Truro; John Greenham, Halifax; Prof. D. U. Hill, Wolfville.

NEW MEMBERS, CANADIAN INSTITUTE OF CHEMISTRY.

The following have been duly elected as members of the Canadian Institute of Chemistry:—

Fellow—Mr. Arthur Fildes, 246 Ponsard Avenue, Montreal, Que. Associates—Messrs. John A. W. Phillips, B.A., 21 Lock Street S., Hamilton, Ont.; John M. Purcell, B.Sc., Cobden, Ont.

NOMINATING COMMITTEES, CANADIAN INSTITUTE OF CHEMISTRY.

The following members of the Canadian Institute of Chemistry have been appointed to the committees named: Nominating Committee for International Chemical Union Representatives, Dr. Baril, chairman, and Dr. Ruttan and H. J. Roast; Nominating Committee for Elections, 1922, Dr. Bigelow, chairman, and Professors Bain and Lehman.

ENGINEERS OF BUFFALO INSPECT CHIPPEWA WORK.

THE Engineering Society of Buffalo has planned a very novel and interesting meeting for Saturday, October 8th. On that date the members of the Society will meet at noon and travel by automobile to Niagara Falls, Ontario, where they will be taken on an inspection tour of the Chippewa-Queenston Hydro-Electric Development which is now being completed. This tour will be conducted by the men in charge of the electrical, hydraulic and construction branches of the work. After the tour, the party will return to Buffalo for dinner at the University Club, where addresses will be given by the engineers in charge of the above development.

The Rochester Engineering Society and the Niagara Peninsula Branch of the Engineering Institute of Canada have been invited to accompany the Buffalo Society on this trip.

FRENCH CONGRESS OF APPLIED CHEMISTRY.

The Societe de Chimie Industrielle de France are holding their annual meeting October 9 to 12 in Paris. The congress consists of thirty-four sections corresponding to the different applications of chemistry, and will be opened on the evening of October 9 by a reception. The opening session will be instituted under the presidency of M. Dior, Minister of Commerce. Papers will be read by experts, visits to works arranged, and a banquet is to be given at the Palais d'Orsay.

BRITISH COLUMBIA INDUSTRIAL NEWS.

A fire on August 30th completely destroyed the Nanaimo Fish-Meal & Oil Refinery plant, at Brechin, Vancouver Island. The plant was built only last year, and was put into operation last December. It was constructed for the manufacture of fish oil and cattle food from dogfish, which are found plentifully in the neighboring waters. The loss is estimated at $50,000.

HEAD OF ABBOTT LABORATORIES DEAD.

The death occurred at Chicago, July 4th last, of Dr. Wallace Calvin Abbott, president of the Abbott Laboratories of Chicago and Toronto. He was a graduate of the University of Michigan and more than thirty years ago established the Abbott Alkaloidal Company, now known as the Abbott Laboratories. He was a member of several medical and pharmaceutical societies, a Free Mason of high degree, and a Methodist in religion. In business he was very efficient and highly esteemed by a wide circle of business acquaintances.

BOOK REVIEWS

"A DICTIONARY OF APPLIED CHEMISTRY."

By Sir Edward Thorpe. Vol. II., Calculi to Explosion; 719 pages; Longmans, Green & Co. Price, $20.00.

Each volume of the new printing of this well known standard text, shows the authors to be appreciative of the general advances being made. It shows also that it is time that American and European chemists united their efforts in such productions. Undoubtedly European authors write books and treat subjects in a different manner than do Americans, because their fund of information is slightly different. Even the greatest men of science are more familiar with the things close to them and the literature they grew up with, than they are with that of a foreign country. For this reason some sections of even this new edition are a little too European to fill the requirements of Americans.

If a general statement could be ventured, it is probably true that American research chemists are more familiar with original European scientific publications than are Europeans with those of America. The production of comprehensive works and dictionaries is not yet a highly developed part of America's contribution to science, but the advantage in complete information on some subjects may often lie on this side of the water. Perhaps the next step will be an International Dictionary of Applied Chemistry edited by joint committees, representative of the best talent in each country. In the meantime this second volume contains a wealth of detail and recent information on such subjects as cement, coke, gaseous explosions, corrosion clay, coloring matters, dyes, etc., cellulose, cyanides, celluloid, as well as a large number of oils, fats and pharmaceuticals and substances coming alphabetically in this section.

There seems to be a tendency on the part of the students and manufacturers to expect to find a book on every phase and detail of a particular branch of chemistry in which they are interested. For them, such a standard dictionary is ideal, and a greater use could well be made of references of this kind, as they contain everything that the average reader requires and suggest original sources of information.

"ORGANIC COMPOUNDS OF MERCURY."

By Frank C. Whitmore; American Chemical Society Monograph Series—Chemical Catalog Co.; 297 pages. Price, $4.50.

When it comes to writing books on such specialized topics only such an organization as that of the American Chemical Society can hope to be successful. They are seeking out those spaces in the library left vacant for various reasons and so far have made a good job of filling in the holes. This is the first monograph on the mercurials in any language, and in it has been gathered a vast amount of scattered work. Even at that everything is by no means covered, and the author frankly admits that it was soon found impossible to make the monograph all-inclusive.

Sixteen chapters are devoted to divisions of the subject commencing with general methods of preparing organic mercury compounds, and some general properties and reactions of these compounds. In separate chapters, alkyl, olefine, acetylene, alcohol, fatty acid and aldehyde compounds of mercury are taken up. This is followed by chapters on mercury derivatives of groups of aromatic compounds. An appendix is given covering the analysis of these substances, and a bibliography of biological and pharmaceutical work with lists of proprietary mercurials and patents covering organic mercury compounds. For those particularly interested the book is invaluable as a reference, and the general chemist need not go beyond it to obtain a conception of what has been done in the field.

"ORGANIC CHEMISTRY."

By Joseph S. Chamberlain; P. Blakistons, Son & Co.; 950 pages. Price, $4.00.

The work is designed as a text of students and is made somewhat more valuable than the average work by the descriptive reading matter surrounding the facts. The treatment of theoretical principles is comprehensive. Like all texts, with one or two exceptions, there is a finality given to the subject which is not warranted by our actual knowledge of the mechanism of organic reactions. The first text of the student may not be the place for such material, but as long as graduates have had an actual contact in a small way with perhaps three dozen organic compounds, and a philosophical knowledge of 200,000, there is bound to be a certain amount of unreality about the subject. The book may be recommended safely as a good text, but there is nothing revoluntionary in the treatment, or even new, unless it be the placing of some remarks on the ultimate analysis of organic compounds at the back instead of the front of the book, and the fairly complete references to standard works given with each chapter.

"FOOD PRODUCTS, SOURCE, CHEMISTRY AND USE."

By E. H. S. Bailey; second edition, revised; P. Blakiston's, Son & Co., 550 pages; Price, $3.00.

This book makes claim to be suitable as a text for students in colleges and high schools, and as such is satisfactory. It is a good general elementary book covering a wide field, but its value for educational purposes in Canadian secondary schools will be limited, as the American data and statistics are not of such primary general interest here.

"AMERICAN CHEMISTRY."

By Joseph S. Chamberlain; P. Blakiston's, Son & Co.; Price, $2.00.

This type of book is chiefly valuable for the work it can do among thoughtful people of affairs who have not had industrial fundamentals put to them from the chemical angle. If the American public ever discovers American chemical industries, it will be through the non-technical press, of which this is a review for the general cheering up of the chemist.

"ELEMENTARY QUALITATIVE ANALYSIS."

By F. C. Reeve; D. Van Nostrand Co.; 143 pages. Price, $1.50.

The particular ideas expressed are (1) to present the main scheme of analysis without the complication of special conditions; (2) to give working directions rather than descriptions; (3) to write chemical equations for all reactions.

OVERSEAS AND FOREIGN INDUSTRIAL NEWS

Special Correspondence to Canadian Chemistry and Metallurgy. By Our London Representative.

Nitrogen Fixation.

In the comprehensive Final Report of the Nitrogen Products Committee of the British Ministry of Munitions (His Majesty's Stationery Office, London, Cmd. 482), published early in 1920, the results of a detailed examination of the whole problem of nitrogen fixation are given. This report was prepared during the course of the war, and the statistics included do not cover the latter part of the period of hostilities and the post-war years. This statistical information has now been brought up to date by the Department of Scientific and Industrial Research in London, under the superintendence of Dr. J. A. Harker, F.R.S., formerly Director of the Nitrogen Research Laboratory, and is now published at one shilling net by the Stationery Office. The Report contains up-to-date information regarding the world's resources in nitrogen products, and in detail respecting the Chile Nitrate Industry, the Saltpetre Industry, the Nitric Acid Industry in Great Britain, the By-Product Industry, the Synthetic Ammonia Industry, the Norwegian Fixation Industry, the Cyanamide Industry, the Ammonia Oxidation Industry, the Fertilizer Industry, and much miscellaneous information is also included, including notes in regard to British developments in Nitrogen Fixation.

The Alsatian Potash Industry.

The intention of the French Government to place the exploitation of the Alsatian potash mines in the hands of four companies is being resisted by many interests in France, which desire the creation of one concern in whose hands the production and marketing of the salts should be placed, claiming that in this way lies the possibility of the most effective competition with German potash resources which are still greater than those controlled by France. A law suit, just terminated at Mulhouse, has, however, assured to an Alsatian the control over more than half the sequestrated ex-German mines in Alsace, the successful litigant being M. Koch, who was formerly Director of the Deutsch Kali-Werke group. Another portion of the country's supposed heritage may also be lost, as a further number of controlling shares has been bought by a Dutchman. The question will undoubtedly come up before the French Parliament.

The German Aluminium Industry.

The rise and growth of the German aluminium industry is likely to exercise a considerable influence on the country's economic position, and should also be studied by Canadian manufacturers, who may, before long, find themselves in competition with this new industry both in the domestic and export markets. About 800 tons of aluminium were produced yearly in Germany before the war, but the present annual output amounts to 15,000 tons, although only very small stocks of bauxite are available, and importation must eventually be essential on a large scale. Bauxite is found in Germany only on the Vogelberg, and the quantity barely suffices to provide one aluminium factory with raw material. Before the war Germany purchased the bulk of her aluminium in France and Switzerland, but in consequence of the serious war-time shortage of copper numerous aluminium works sprang up whose raw material was chiefly Istrian and Dalmatian clay. Most of these works, however, did not survive the conclusion of peace as production from such materials became unprofitable. After the war the efforts of the manufacturers ran in two directions. On the one hand attempts were made to establish works in Southern Germany, where Alpine waterpower is a promising source of energy, as in the case of the "Inn" works, with which the Algemeine Electricitaets-Gesellschaft and Siemens-Schuckert are associated. On the other hand, an effort was made to improve the process of manufacture, so as to transform the poorer German clays into pure clay. Further successful attempts have been made to manufacture aluminium without clay, though this process is not as yet used for production on a large scale. The next steps will be to improve the quality of aluminium and to endow it, as far as possible, with the qualities of refined steel. Much scientific progress has been made in this direction.

Nitrogen Production in Germany.

For the further development of the atmospheric nitrogen plants in Germany a new company has been formed, entitled Ammoniakwerke Merseburg-Oppau G.m.b.H., with a capital of 500 million marks, which has been subscribed by the members of the group proportionately to their participations in the pooled profits of the group. The Badische Company has transferred to this new company all its nitrogen plants at the valuation taken for the purpose of the balance sheet at December 31, 1920, and the nitrogen business, whilst under the complete control of the group, will be operated as a separate undertaking. It has been recently announced that the company will place artificial urea on the market for fertilizing purposes, and if offered at a reasonable price it will have a great effect on the consumption of other fertilizers. The French Government has arranged with the Badische Company for the use of the Haber patents in France.

The latest product of the German nitrogen industry which has appeared on the market—and of which limited quantities will become available in the course of this year—is synthetic carbamide, invented by Professor Bosch and produced by the Badische Anilinund Sodafabrik. Synthetic carbamide, according to Dr. Bueb, Director-General of the German Nitrogen Syndicate, will probably prove the ideal nitrogen fertilizer. This product is claimed to have a nitrogen content three times that of Chile saltpetre, and to constitute a fertilizer which, besides being weather proof to a high degree, has also shown itself to be innocuous even when used to excess, and bids fair to become the world's future nitrogen fertilizer.

Chilean Nitrate.

Stocks of nitrate available in Chile are estimated at 800,000 tons, and the Government is endeavouring to obtain control of the whole output with the intention of regulating the price. The proposal does not, however, meet with the approval of the producers, who believe that they are in a better position to handle the product. It is reported at Santiago that a large corporation is about to be organized in the United States for the purpose of increasing the sale there of Chilean nitrate. The company proposes to launch a big publicity campaign in an endeavor to create a better demand for the product among American farmers.

The Guatemalan Government is seeking to encourage the increase in production and use of industrial alcohol by exempting from taxation its manufacture for use in the production of heat, light and power, and removing taxes from alcohol used in the manufacture by authorized distil-

ies of such products as varnish, ether, medicinal extracts and other chemical and pharmaceutical products, except perfumery. A large part of the raw material which could be derived from the sugar industry is now wasted.

Sugar factory owners in Pernambuco are arranging to use alcohol from molasses as fuel and require machinery for the purpose.

Nauru Phosphate.

Phosphate from the Island of Nauru, in the South Pacific, formerly German-owned, is now being brought to Newport, in South Wales, for manufacture—with basic slag—into fertilizer material. Contracts call for deliveries up to 215,000 tons during 1921 and 1922.

The South African Wattle Bark Industry.

At the moment the wattle bark industry of Natal is suffering from severe depression. Considering the fact that South Africa holds so strong a place as a producer and that wattle bark is one of the best tanning materials known, a recovery to a point that will permit profitable planting should take place within a reasonable period. The only new competitor is the Kenya Colony, where the black wattle comes to maturity in the fourth to fifth year, or about 12 months earlier than in Natal.

The plant of Wood Chemicals, South Africa, Limited, at Seven Oaks, Natal, is now nearing completion. This company will take all the wattle timber that is produced within an economic radius and extract Stockholm tar, wood naphtha, and charcoal. Later, if the enterprise is successful, acetic acid, acetone, and chloroform will also be manufactured.

The capacity of the plant that is being installed will be about 25 tons of wood per diem.

Copal, which enters largely into the manufacture of varnishes, is found in large quantities in the marshy forests of the Central Congo. It is obtained from trees, but is also found in a fossilized state.

Straits Settlements Rubber Exports.

An official cablegram from Singapore to the Malay States Information Agency, 88 Cannon Street, London, E.C. 4, states that 10,111 tons of rubber (transhipments, 1,810 tons) were exported from Straits Settlements ports in the month of June, as compared with 8,813 tons in May, and 11,663 tons in the corresponding month last year. The half-year's exports amounted to 43,912 tons, as against 73,483 tons last year, and 82,725 tons in 1919. Appended are the comparative statistics:—

	1919 Tons	1920 Tons	1921 Tons
January	14,404	13,125	5,809
Feburary	15,661	17,379	5,813
March	20,908	5,931	7,275
April	10,848	9,768	6,091
May	15,845	15,617	8,813
June	5,059	11,663	10,111
	82,725	73,483	43,912

Spain.

A German mining journal has received information that recent borings for potash by both German and American interests working in various parts of Spain have proved unfruitful, no potash or rock salts having been found, and it is believed in consequence that potash mining in Spain generally cannot be carried on profitably.

The output of raw lignite in Central Germany during June was 6,932,820 tons, while the production of briquettes amounted to 1,735,883 tons. The corresponding figures for May were 6,466,345 tons and 1,564,307 tons.

The foundation stone of a lignite research institute has just been laid at Freiburg in Saxony. The cost of the building (10,500,000 marks) is borne by the Saxon state, the industry and the town of Freiburg.

Nitrate Production in Germany.

Prior to the war, the principal sources of domestic nitrogen production in Germany were coking plants and gasworks, which produced 100,000 tons annually. This output now amounts, however, to only about five per cent. of the total production, the rapid extension of the Frank-Caro calcium cyanimid process and the ammonia high-pressure process developed by Haber and Bosch having formed a feature of the war and post-bellum period.

Federated Malay States Tin Exports.

An official cablegram from Kuala Lumpur to the Malay States Information Agency, 88 Cannon Street, London, E.C., 4, states that 2,752 tons of tin were exported from the Federated Malay States in the month of June as against 2,884 tons in May and 2,940 tons in the corresponding month of last year. The total export for six months was 16,927 tons compared with 18,336 tons last year and 18,460 tons in 1919. Appended are the comparative statistics:—

	1919 Tons	1920 Tons	1921 Tons
January	3,765	4,265	3,298
February	2,734	3,014	3,111
March	2,819	2,770	2,190
April	2,858	2,606	2,692
May	3,407	2,741	2,884
June	2,877	2,940	2,752
	18,460	18,336	16,927

Last year's export of tin from the Federated Malay States amounted to 34,935 tons, valued at £10,316,737, compared with 36,935 tons in 1919, valued at £8,736,474. In 1918 the exports amounted to 37,370 tons.

Australian Dyes.

Australian Dyes Proprietary, Limited, is about to begin operations after seven months of successful experimenting. Manufacture will be carried on at East Richmond, Victoria. At the outset, eight dyes will be produced on a commercial scale. The company is asking for a duty of 2s. per lb. British, and 3s. 6d. per lb. general, as from January 1, 1922, with a view to later requesting much higher protection.

Manganese Bronze.

One of the latest additions to the list of new industries in Austrlia is the manufacture of manganese bronze, used for the construction of ships' propellers. At Port Waratah, Newcastle, N.S.W., Messrs. John Lysaght (Australian), Limited, have begun the production of black and galvanized corrugated sheet iron, with a capacity of 450 tons per week. The birth of this branch of the iron and steel industry practically completes the chain of this department of industrial enterprise in Australia.

Japanese Output of Camphor.

Owing to the dullness of trade with America and the inactivity of the celluloid industry, last year's supply of camphor in Japan is still unsold. The monopoly office has therefore decided to reduce its output for 1921 to 6,000,000 kin, which is 1,000,000 kin less than last year. The prices, however, will not be reduced.

A factory is being erected in Japan under Government

supervision for the production of aluminium by a new process.

Japan's production of cement this year is estimated at 11,000,000 casks, compared with 7,850,000 casks last year.

Germany and Chinese Dye Market.

The British Chamber of Commerce in China have issued a report calling attention to the rapid progress which Germany is making in exports of aniline dyes to China, and to the distance we have fallen behind in the competition. In January, 1920, Germany sent to Shanghai alone aniline dyes, exclusive of indigo, valued at 24,250 Haikwan taels, against 12,005 of British origin. Both totals were small, but the disparity was not important. By June, however, Germany's figures had mounted up to 417,116, whereas ours were only 12,776. The totals for the year were: British, 305,152; German, 2,168,377; all sources, 5,219,923. The figures for the first two months of 1921 show that the dyes of British origin imported were valued at 62,941 H. taels, while those from Germany show a value of 529,250 H. taels.

Phosphate Products in the United States.

The phosphate rock industry in the United States during 1920, according to figures compiled by the United States Geological Survey, created a record far surpassing that of any previous year. The quantity of phosphate rock mined and sold was 4,103,982 long tons, or nearly a million tons more than in the record year 1913. The total receipts from sales was $25,079,572, or more than twice as much as in any other year. The average price per ton for the entire output was $6.11 as compared with $5.10 in 1919.

NOTES.

In accordance with the provisions of Section 2 (6) of the Dyestuffs (Import Regulation) Act, 1920, the President of the Board of Trade has appointed a committee to advise the Board of Trade with respect to the efficient and economical development of the dye-making industry.

Output of Luxemburg ore mines during 1920 was 3,704,400 tons, as compared with 3,112,400 tons in 1919, and 7,333,370 tons in 1913. The figures in 1920 and 1919 for pig iron are 692,940 tons, and 617,430 tons, and for open hearth pig-iron 569,550 tons, and 366,230 tons.

Lyons Autumn Fair.

The fair which is to be held at Lyons in October will be more particularly consecrated to metallurgical products, and France will be shown in the role of a great producer of iron, cast-iron and steel, and an important manufacturer of machinery.

It has been discovered in Ceylon that cocoanut shells will yield a valuable non-corrosive antiseptic tar which forms an excellent vegetable substitute for the acetic-acid creosote used in the preparation of rubber.

A careful survey of the iron-ore deposits of Ceylon is now being made by the Ceylon Industries Commission. Centuries ago Ceylon steel was exported to Damascus and employed in the manufacture of the famous Damascus sword blades.

Castor-oil plants are being grown by rubber estates in Ceylon as a catch crop owing to the low price now obtainable for rubber.

Iron and Steel Production.

The production of iron and steel in the United Kingdom, which in 1920 almost reached the 1913 figures, shows a large decline in the first six months of 1921, amounting to 1,565,900 tons of pig iron and 1,412,600 tons of steel ingots and castings, as against last year's totals for the six months in question amounting to 4,145,000 tons and 4,877,000 tons, respectively. Recovery of output has begun, but the industry is keenly anxious to secure a reduction in the prevailing high cost of coal.

Suction Gas-Producer for Automobiles.

A British firm has put on the market a producer-gas plant for attachment to automobiles and motor trucks which utilizes as fuel coke or anthracite, or even wood charcoal, and is stated to render possible a great saving due to the high cost of petrol, the use of which is replaced.

Free Importation Into Great Britain of Empire-Produced Industrial Alcohol.

A clause has been introduced into the Finance Bill before the British Parliament providing for the free entry of spirit produced within the Empire for power or industrial purposes, and for a greatly diminished duty on similar spirit imported from foreign countries. Home-produced spirit will receive a bounty of fivepence per gallon.

Italy.

An experimental bureau has been set up at Castelbuono di Sicilia for the cultivation, study and sale of manna ash (Fraxinus ornus). Two-thirds of the entire Italian crop of an article used by druggists in nearly every part of the world is produced at the place mentioned.

CORRECTION RE ASBESTOS PRODUCTS MADE IN CANADA.

In our August issue, p. 244, when discussing new operations of the Canadian Johns-Manville Company, Ltd., we gave the impression that they were the first to manufacture finished asbestos products in Canada. This is hardly correct, as we find that the Asbestos Manufacturing Company erected a plant at Lachine in 1909. Dr. Mattison of Ambler, Pa., erected this plant and sold his interests in 1910, when the plant was greatly expanded and reorganized. In 1918 the Dominion Asbestos and Spinning Co., Ltd., was organized at East Broughton, but the venture was not a success. In 1920 Mr. Jos. Poulin organized the Asbestos Company Limited for the manufacture of brake bands. This plant is also at East Broughton, Que. It is evident from records of the Quebec Bureau of Mines that the fabrication of asbestos products has been established for some time in Canada.

Blending Natural Gas Gasoline.—D. B. Dow, assistant organic chemist, U.S. Bureau of Mines, has prepared a report on methods of blending natural-gas gasoline, giving the results of work done for the purpose of finding a blending material that could be produced more cheaply than 50-52 naphtha and which at the same time would give a product that could be blended with straight-run gasoline without raising the endpoint of the final product.

ASBESTOS DEPOSITS IN ONTARIO BEING DEVELOPED.

Development work is being carried on at the Sinclair asbestos property in Bannockburn township, Matachewan district, Ontario. Samples of first-class asbestos have been brought out from the property. Arrangements have been made to bring out a carload of "crude." Owing to transportation difficulties only the better grade of fibre is being considered at present. As No. 1 crude brings over $1,500 per ton, transportation on this class of material is not prohibitive. The new light railway which is now in the course of construction in Northern Ontario will aid development to a great extent.

Mining and Metallurgy in British Columbia

(Special Correspondence to Canadian Chemistry and Metallurgy.)

THE Federal Mining & Smelting Company, a subsidiary of the American Smelting & Refining Company, has bonded the Stemwinder mine and the Ontario group, adjoining the Consolidated Mining & Smelting Company's Sullivan mine, at Kimberley. The terms of the bond have not been announced, but it is known that the Federal company is to have ample time to explore the property with a diamond drill. The Federal company had the Stemwinder mine, which is owned by MacKenzie & Mann interests, under option for several months in 1918, and did a considerable amount of boring before relinquishing the option. The result of the boring, however, was never divulged. Several reasons may account for the Federal's return to the property. It is possible that with lead and zinc prices at little more than half what they were in 1918 and with money much tighter more satisfactory terms may have been obtained on the property. On the other hand, the splendid development of the Sullivan mine, which last year provided more than 90 per cent. of the zinc and close to 70 per cent. of the lead outputs of Canada, and the fact that, after spending some three-quarters of a million dollars in experiments, the Consolidated company has devised a process for treating the unusually complex ore found in the Sullivan mine, is more likely to have been the reason that has attracted the Federal back to the East Kootenay field. Drilling operations have been started, and it is stated that the company is prepared to spend $3,000,000 in the development of the mine if it meets with due encouragement in its explorative work. The Federal, of course, has an exceeding strong financial backing, and it is probable that in the event of a large ore deposit being proved at the Stemwinder and Ontario properties the company will erect a lead smelter and electrolytic zinc plant at or near Kimberley. There is a considerable feeling of satisfaction among the independent mine operators at the return of the Federal to the province.

Largest B.C. Gold and Silver Producer.

The Premier Gold Mining Company has sent its first consignment of concentrate to the Tacoma smelter. The concentrate was produced mainly from cullings of high-grade ore that already had been shipped. The first consignment consisted of 160 tons of concentrate, valued at $1,750 per ton, or something like $280,000 for the consignment. This is nearly three times the price that the Neill syndicate paid for the mine less than four years ago, and it establishes the Premier as the largest gold and silver producer in the province. As soon as the tramway now under construction between the mine and tidewater is completed, regular shipments of both high-grade ore and concentrate will be made. A large body of ore has been developed above the present bottom workings, and it is stated unofficially that diamond drilling has proved the continuation of the ore shoot to a depth of 600 feet below the bottom workings.

At least three other mines will be shipping from the Salmon River district during the coming winter. The Fish Creek Mining Company, which has been developing a promising vein on Fish Creek, a tributary of the Salmon River, on the Alaskan side of the international boundary, has made a trial shipment of about 20 tons, which is expected to run between $500 and $600 in gold and silver per ton, and has 100 tons of similar ore mined.

Silverado Group Purchased.

The Silverado group, which is situated on the mountain on the opposite side of Bear River from Stewart, has been purchased by a Vancouver syndicate headed by J. J. Coughlan, the shipbuilder. Some 20 tons of ore had been taken out previous to the purchase, and a sampling of this by the purchasers gave an assay return of $2.40 in gold and 1,566 ounces in silver per ton and 14.8 per cent. of copper. The vein, which averages between a foot and sixteen inches in thickness and is heavily charged with freibergite in places, has been traced up the side of the mountain between elevations of 2,000 and 4,200 feet. The new owners are putting in a light tramway to connect the mine with tide-water, a distance of 8,000 feet, and are establishing a permanent camp at the mine. If this work is completed before the winter sets in it is probable that regular shipments will be made from the mine.

Trial Shipment From Outland.

The Outland Silver Bar Company, which is developing the Outland group, 25 miles up the Salmon River, is making a trial shipment of 50 sacks of ore, which is being taken out on pack horses. This property is 14 miles farther up the river than the Premier mine, and until better means of communication have been made, regular shipping will be impossible. It is likely, however, that some ore will be raw-hided out during the winter.

Big Missouri Taken Over.

Two companies, one a holding one known as the Portland Canal Mines, and organized in the United States, and the other known as the Daly Mines, Ltd., and organized in British Columbia, have been formed to take over and operate the Big Missouri mine, at the head of Salmon River. This property was under option for more than a year to Sir Donald Mann and associates, but the option was relinquished. The present companies are comprised mainly of New York people who, it is stated, are prepared to spend half a million dollars in the development of the property. Besides the foregoing, there are a number of promising prospects in the district, and there is little doubt but that the Salmon River district will give a very good account of itself in the near future. The Provincial Government is constructing a road up to the head of the river and several mines have suspended operations until this work is completed, the cost of taking in supplies under existing conditions being too excessive.

Smelter Operations.

Despite the continued low metal prices, the Granby company is turning out about 2,500,000 pounds of blister copper monthly at its Anyox smelter, while the receipts at the Consolidated company's smelter at Trail reached 282,916 tons for the first eight months of the year, and are in excess of any similar period since the armistice. A little more life is being shown in the Slocan district, but the difficulty at the present time is the smelting of the ore, as the Consolidated is not buying custom ore at this time.

New Schedule of Smelting Charges.

A conference was held at the Hume Hotel at Nelson recently between officials of the Consolidated Mining and Smelting Company and the independent mine owners in the Slocan district, for the purpose of arranging a new schedule of smelting charges. The conference was called by the smelting company, which means, of course, that the company is in the market again for the purchase of ores. Since the commencement of the year the company

has not encouraged independent mine owners, offering only warehouse receipts for the metal contents of ores treated. The basis for a new schedule was threshed out at the meeting, the principal points decided being that the company will pay for 95 per cent. of the silver and 90 per cent. of the gold content of the ores, regardless of the zinc content, and will give 90-day notes for the same on the day of sampling. These, of course, can be cashed readily at the local banks, the majority of which refused to advance anything on warehouse receipts. Settlements for lead are to be based upon London prices until domestic consumption becomes equal to production, when Montreal prices will be substituted for London ones. Silver prices will be based on New York "foreign" quotations, shippers to benefit for rate of exchange above 3 per cent., the company retaining only that amount.

The new schedule will be more advantageous to the independent mine owners than the one in use last year, in which heavy penalties were charged for zinc contents in excess of 10 per cent., and undoubtedly it will give an impetus to mining in the Slocan.

THE CHEMICAL SECTION AT THE CANADIAN NATIONAL EXPOSITION.

THE companies taking part were fairly representative of Canadian Chemical industries, although there are still several who might well round out the sections. This is the second year of this experiment, and space seems still to be unavailable for further expansion. The authorities of the Exposition hope that conditions may be much better by another year, and it is certain that the chemical section would use twice the space they now have if it were available. Those companies who are behind the idea report that there are indications of real possibilities in such an annual exhibit. They were favored in some cases with calls from a large number of customers, and the interest shown was considerable. It will take some time for chemistry to break into such an exposition, but the exhibit is one of the best single factors operating from a public educational standpoint. The chemists from overseas were surprised to find such a chemical section established, and expressed very favorable opinions of the displays of the various companies. What is needed is a little more co-operative effort on the part of the sales forces of these companies, and a strong move to get together on the general question of expanding the size of the section and the preliminary publicity necessary to draw interested people during the two weeks it is running.

Every exhibit received a high mark of merit from the Exhibition judges.

The companies displaying were:—

Watson Jack & Co., Ltd., Montreal. Dyestuffs and materials from Canadian mills dyed with their colors. Dyeing machinery.

Basque Chemical Co., Ltd., Toronto. Natural Magnesium Sulphate for medicinal and chemical purposes.

T. E. O'Reilly, Ltd., Toronto. General chemical brokers and agents for chemical manufacturers, with samples of products of those companies.

Canadian Salt Co., Ltd., Winsor, Ont. Varieties of common salt and chemicals manufactured from salt. A working model of a salt well.

Nichols Chemical Co., Ltd., Toronto. The feature of this display was Hard-N-Tyte, a chemical treatment for concrete and mortar. Sulphuric, nitric and other industrial acids, copper sulphate, copperas and grades of alum were also exhibited.

Brunner, Mond Canada, Ltd., Amherstburg, Ont. Various grades of soda ash for industrial and domestic purposes.

De Laval Separator Co., Peterboro, Ont. Type machines as used by chemical and allied industries.

National Aniline & Chemical Co., Toronto. Dyestuffs, food colors, intermediates.

Canadian Industrial Alcohol Co., Montreal. Various grades of alcohol conforming with all legal denaturants. A complete display of products, the manufacture of which involves the use of industrial alcohol.

Canadian Hanson & Van Winkle Co., Ltd., Toronto. General electro-platers' supplies and equipment, anodes, chemicals, and metal cleaners.

International Nickel Co., Toronto. Monel metal, all types of nickel products from golf sticks to valves. A very complete display of nickel products.

THE CANADIAN SECTION AT THE NEW YORK CHEMICAL EXPOSITION.

CANADA was very well represented at the Seventh Chemical Exposition, and a vast amount of good publicity work was accomplished. No less than four branches of Dominion Government Departments were represented. The Department of Mines had a very large space showing most of the industrial minerals of the country. Every province had something of interest.

The Bureau of Statistics had a booth where general information was available on chemical mining and metallurgical industries. The decorative feature of this display was a number of transparencies showing concise information in tabulated form. The Department of Interior through its water powers branch and the Forestry Department, supplemented the General Dominion exhibit with maps and collections of products from wood distillation, and chemicals produced by the use of the electric current.

The Canadian Pacific Railway had a large electric map of the Dominion which was wired in such a way as to light up points at one time which were of common interest. For example, by pressing a button, the coal areas would be indicated by colored lamps. In this way the location of industries was shown. Their exhibit created unusual interest.

The British America Nickel Co., of Ottawa, had some new things to show. Under the Madsen process, they are manufacturing malleable nickel which can be used for many purposes, from phonograph records to evaporator tubes. This opens up a rather new field for nickel products. They also had sheets, anodes, nickel salts, and the largest electrode ever made of nickel. This was 5 ft. 2 inches wide and 19 ft. 6 inches long, with a width of .07 inches. This company is also recovering the various precious and rare metals occurring with the nickel at the Sudbury deposit. Samples of platinum, gold, iridium, and palladium were shown.

CANADIAN DAIRY INDUSTRY.

A total of 3,165 dairy factories in Canada had a total production value of $144,483,188 in 1920, as compared with $135,196,602 in 1919, an increase of $9,286,586, according to the Dominion Bureau of Statistics. Capital invested in dairy factories in 1920 amounted to $32,767,317; the number of employees was 11,211, and the amount paid in salaries and wages was $8,776,676. For 1919 the corresponding figures were: Capital, $28,388,026; employees, 10,716; and salaries and wages, $7,629,997.

ONE-FIFTH OF GERMAN NITRATE PRODUCTION ELIMINATED.

One-fifth of Germany's nitrate production was wiped out in the explosion that wrecked the Oppau works of the Badische Anilin und Soda Fabrik on the Rhine in Germany, Wednesday, September 21st. Details concerning the disaster have not come through as yet, though press despatches state that over 500 bodies have so far been removed from the wreckage. This plant, which was the German mainstay for nitrogen during the war, had a capacity of 100,000 tons of nitrogen a year, a production about equal to the entire yearly nitrogen output of all the by-product coke oven p'ants in the United States. According to "Science Service" despatches from Washington, the wrecked German plant could have supplied one-third of all the nitrogen that America is using yearly for fertilizer, chemical, and all other purposes.

Germany has still another nitrogen plant of twice the producing capacity of the destroyed Oppau works. This is located at Merseburg, on the Strassfurt deposits, using the same Haber-Boshe process as was used at Oppau, and with a capacity of 200,000 tons a year. This plant was half built at the time of the armistice and has since been finished.

The wrecked Oppau plant was comp'eted during the war at a cost said to be nearly $60,000,000. Over one hundred buildings made up the factory and docks, which was laid out systematically with ample railroad facilities. The laboratories were located in a fine building, including lecture rooms, and this building alone cost $800,000. Features of the plant were compressors of enormous strength that compress a mixture of hydrogen and nitrogen at 200 atmospheres of 3,000 pounds per square inch. The plant was begun in 1912.

Even with the loss of the Oppau plant, it is stated that Germany will be able to supply her own needs for nitrate, and still have a surp'us for export. During the past month, the Atmospheric Nitrogen Corporation, a United States concern, has commenced operations at their plant at Syracuse, N.Y., which uses a modification of the Haber process. The capacity of the Syracuse plant is just one-thirtieth of that at Oppau.

No definite explanation of the explosion has been offered up to the time of this journal going to press.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Method for Producing Solid Peroxides.
W. Weber, Pat. 212158, May 31, 1921. In the electrolytic production of solid peroxides such soluble compounds and added to the electrolyte as will form with the H_2O_2 formed at the cathode insoluble compounds and O or O-containing gases are introduced into the cell.

Decomposition of Alkaline Chloride Solutions by Means of Electrolysis.
K. Heinemann, Pat. 212061, May 31, 1921. In an electrolytic process for decomposing alkali chloride solutions by means of a Hg cathode and a porous diaphragm separating the electrodes, the electrolyte is circulated from one compartment of the cell to the other, thence to the saturating device.

The Production of Alkalies and Chlorine by Means of Mercury Cathodes.
K Hindemann, Pat. 212060, May 31, 1921. In cells for electrolytically decomposing alkali chloride solutions by means of a flowing Hg cathode, a stationary horizontal plate is provided with impediments on its surface forming right angles with the direction of flow of the Hg The Hg surface is thus kept in continuous agitation.

Ammonia and Ammonium Compounds.
G. G. and I. E Knapp. Jr., Pat 180816, Dec. 4, 1917. A N— containing material (e.g., dimetal isocyanide) is treated with steam below 350° to the point of saturation and then the temperature is raised to or above 450° while the steam treatment continues.

The Extraction of Nickel from Silicate Ores.
H. W. C. Annable, Pa. 183827, April 23, 1918.

Manufacture of Steel.
Aladar Pacz, Pat. 212367, July 5, 1921. A steel contains a metal of the Niobium Class and may contain W.

Recovery of Nitrogen Oxides.
P. A. Guye, Pat. 212391, July 5, 1921. Oxides of N are recovered from mixtures of gases by oxidizing the oxides to produce a mixture of oxides of N which will not solidify above 8° and then liquifying the oxides by refrigeration.

The Recovery of Nitrous Oxides.
P. A. Guye, Pat. 212392, July 5, 1921. Nitrous oxides are recovered from a mixture of gases by liquefying the oxides at a temperature at least 20° by direct contact with a refrigerating liquid capable of dissolving the oxides without interacting therewith.

Process of Sintering Phosphatic Materials.
Washburn, Frank S., Pat. 212558, July 19, 1921. A mixture of phosphate rock and silicious material is sintered to form a porous mass which with C is charged into an electric furnace and heated to drive off the P. The C. may be sintered with the other ingredients and form part of the porous mass.

Production of Phosphoric Acid.
Frank S. Washburn, Pat. 212557, July 19, 1921. A mixture of phosphate rock and silicious material is preheated and subjected to a temperature sufficient to fuse the mass and liberate a portion of the P.; the fused mass is then heated further to liberate all the remaining P, the gaseous products of this reaction being used to fuse and preheat fresh charges of raw material.

Separating Sulfur Dioxide from Gas Mixtures.
R. H. McKee, Pat. 212540, July 19, 1921. SO_2 is separated from gas mixtures by absorption in a silica gel. The dust and moisture is first removed and the temperature reduced to below 25° and the gas is passed through the gel. The SO_2 may be removed from the gel by the use of a vacuum pump and passing a heated portion of the discharged SO_2 through the gel.

Production of Magnesium or Alloys of Magnesium and Bye Products.
E. A. Ashcroft, Pat. 212504, July 19, 1921. Hydrated $MgCl_2$ is dehydrated and the anhydrous product is electrolyzed to produce Mg and Cl gas, the Cl is absorbed in a MgO emulsion, thus producing Mg chlorate and hydrated $MgCl_2$ which are separated and the latter re-used in the process.

The Production of Anhydrous Double Chlorides of Magnesium.
E. A. Ashcroft, Pat. 212,502, July 19, 1921. Hydrated $MgCl_2$ is dehydrated by heating to above 250° and a current of HCl gas is applied to absorb and remove the remaining water of hydration. A voluminous current of heated air may be used prior to the application of the HCl gas.

Apparatus for the Electrolytic Decomposition of Anhydrous Magnesium Chloride.
Edgar A. Ashcroft, Pat. 212503, July 19, 1921.

Alloy Filament.
Aladar Pacz, Pat. 212669, July 26, 1921. A filament for incandescent lamps consists of W with a small percentage of Zr.

Anti-Freeze Solution.
Ernest Wm. Lee, Pat. 212662, July 26, 1921. An anti-freeze solution for motor radiators, etc., contains 325 lbs. NaCl, 3 lbs. 2 oz. powdered ammonia and 10 oz. magnesium citrate in 100 gals. of water.

FIRST BATCH OF DYES MADE IN CANADA.

Canadian Dyes, Limited, Trenton, Ont., on September 19th, 1921, turned out the first batch of dyes ever manufactured in Canada when, on that date, about 1,700 pounds of Canadian Direct Blue, 2B., were successfully finished in the first process of making. This is an important event in the history of chemical progress in Canada.

CEMENT PLANT PROPOSAL AT OWEN SOUND.

Some months ago the Ontario Government announced that a provincial-owned cement plant might be erected at Owen Sound, Ont., and negotiations had proceeded favorably, when a further announcement was made that the province would not build a plant at the present time. Private capital at Owen Sound now express their willingness to construct a plant there provided they have definite assurance that the government will not enter later into competition. There is a remarkable supply of raw material at Owen Sound and the company expect to make from 3,000 to 4,000 barrels per day. Meanwhile the premier will be interviewed as to the government's course.

REPORTS RECEIVED.

Directory of Chemical Industries in Canada—Dominion Bureau of Statistics, Ottawa.

The first edition of this directory was published in 1919, and contained the names, addresses, and products of nearly 500 Canadian concerns operating over 600 plants in various parts of the Dominion. The latest edition, that of August 1, 1921, gives a more comprehensive review of these industries than was possible with the first edition. The number of firms listed has been increased to 818, and the number of plants to 1,002. The information given is as of date, January 1, 1921. The directory has been compiled under the direction of Mr. S. J. Cook, B.A., A.I.C., Chief of the Mining, Metallurgical and Chemical Branch of the Bureau, who is eminently fitted for the supervision of such an important work. An article by Mr. Cook dealing with the chemical industries of Canada during the reconstruction period and present opportunities for chemical progress in Canada is printed as introduction to the directory. The directory follows the plan of the first edition, the information being presented in two sections: (1) An alphabetical list of the concerns, the head office address of each, the location of branches where such exist, and a detailed list of the products of each, including in the latter both chemicals and resulting products from chemical processes; (2) an alphabetical list of the chemical products manufactured in Canada, together with the names and addresses of the concerns engaged in the manufacture of each.

It should be mentioned that the Mining, Metallurgical and Chemical Branch of the Bureau is now engaged in bringing out an annual series of reports in individual groups of chemical industries, as well as a summary of the chemical industry as a whole. The work that the Bureau is doing is to be highly commended, and the Directory can only be fully appreciated by the having of a copy on one's desk, and the frequent consulting of it.

A COURSE IN INDUSTRIAL METALLOGRAPHY.

For several years past there has been given in the Department of Metallurgy, McGill University, an extension course in Metallography which has been attended by mechanics, engineers, chemists, and those desiring a "hobby" or whose business brought them in contact with metals and who desired to have more knowledge of their composition.

No previous knowledge of the subject is assumed and the course is essentially practical from first to last. Ferrous and non-ferrous metals are dealt with equally and training given in preparing them for examination under the microscope and finally photographing the various structures which develop.

Anyone desiring to enrol should apply to Dr. Alfred Stansfield, Department of Metallurgy, McGill University, or to the lecturers, Harold J. Roast, F.C.S., F.C.I.C., or Charles F. Pascoe, F.C.I.C.

The first class will be held on Monday evening, November 7th, at 8 p.m., in the Chemistry Building, McGill University.

Fee for the course of 15 periods, $20.

As only fifteen members can be accommodated, application should be made at once.

The microscopic equipment has been added to considerably this year, particularly in regard to the photographic end. If any former members desire to continue their work, provision will be made for an advanced class if sufficient members are obtained.

COMPANY NOTES AND NEWS.

ADVANCES IN STONEWARE EQUIPMENT.

One of the usually well represented fields at the Chemical Exposition is stoneware equipment. The leading companies again demonstrated progress both in design and general efficiency. General Ceramics Co., Inc., Maurice A. Knight and U.S. Stoneware, as well as the Acid Proof Clay Products Co., all had most interesting exhibits. Discussing progress in detail with a representative of Maurice A. Knight, it appears that the outstanding advance for the year in their plant had been the great reduction made in the thickness of the walls of some vessels. This had actually been cut in two by the use of better materials now available. The tendency is to produce thinner, stronger, lighter products which will stand up as well under pressure. In smaller parts certain changes in design are features which should do away with danger and breakage.

ANNUAL MEETING, TORONTO ENGINEERING ALUMNI.

Elaborate preparations are under way for the Third annual gathering of "School" men, which will be held in Toronto on the 4th and 5th of November. Arrangements this year are being made on a much larger scale than in previous years and it is expected that among the long list of distinguished guests will be one or two of international reputation. The graduates are coming from all parts of Canada and the United States and it is expected that upwards of one thousand will attend the Reunion. The programme embraces the official opening of the new Science Building at the University, dinner dance at the King Edward, numerous class reunion luncheons, Queens vs. Varsity rugby game, and winds up with one of the long famous "School" dinners on Saturday night. At the Annual Meeting on Saturday morning, broad questions relative to university policy, technical education and professional matters will be discussed.

NEWFOUNDLAND PROTESTS U.S. DUTY ON COD OIL.

The proposed United States duty of 12½ cents per gallon on imports of cod liver oil is troubling the producers in Newfoundlan. Sir Robert Squires, Premier of Newfoundland, has taken the matter up with Washington. Should Newfoundland oil be sent to Europe instead of the United States, the American leather and pharmaceutical trades will notice the difference. Newfoundland buys $16,000,000 worth of goods per annum from the United States and in return the United States purchases from Newfoundland amount to only $4,000,000, so that the proposed duty would probably injure American business more than it would assist it, in this particular instance.

Chemical, Oil and Metal Markets

The quotations below represent manufactures' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

CHEMICALS.

The Chemical Market in general during the past few weeks, continues to show satisfactory growth. Prices on the whole were fairly staple. A few sharp advances were recorded, possibly owing to increased buying, lower ex-

change rates in Europe and no spot supplies being available. Many chemicals are in short supply, and with this in mind it clearly demonstrates that there is hardly a house with a complete line of supplies for spot delivery, and where goods have to be imported from Europe considerable delay will be experienced by the buyer who did not place his orders until actually requiring the goods.

Prices in foreign chemicals were very irregular. Potash compounds and a few other miscellaneous chemicals increased in price. Caustic Potash ½c per pound, Potassium Chlorate 1c, Yellow Prussiate of Soda 1½c. Higher prices are being received in the mail and latest cable from London and Hamburg showed spot, and future deliveries at higher prices. Caustic Soda again advanced 10c, Barium Products were very erratic, the chloride advancing $5.00 per ton. Salammoniac advanced ½c, as also did Oxalic Acid ¼c. White Arsenic declined ½c, Alum ¼c, Soda Bicarbonate 25c per 100 lbs. Carbon Tetra Chloride 1c.

In the drugs and pharmaceuticals, there was a much better undertone and a noticeable increase in repeat orders which covered a fairly wide range. Large quantity orders however were few and far between. Prices in American Bromides were reduced 5c per pound, which was due to the sharp competition of goods imported from Europe. Iodide of Potash declined 25c, Permanganate of Potash, 1c.

There was no marked change in the paint material market. Stocks outside of first hands are now very low, which is a very encouraging condition. The slightly increased demand for readymade paints show a little painting is still being done.

METALS.

Copper.—There seems to be some small improvement in the copper market. It is estimated that the United States surplus stocks of copper have been reduced by 100,000,000 pounds since the first of the year, and they now stand at about 1,200,000,000 pounds. Though production has automatically been greatly curtailed in order that these heavy stocks might become absorbed, yet on account of the unsettled demand it is difficult to state just when these stocks will be depleted. Production of copper in the United States during July, 1921, was only 22,034,000 pounds. Prior to the war the average monthly output was 102,000,000 pounds.

In connection with copper production in Canada it is significant that the Board of Trade of Trail, B.C., has sent a memorial to the Minister of Finance, Ottawa, urging that a duty be placed on copper rods entering Canada, in order to protect the relatively small Canadian industry from the competition of large American plants. The war tax of 7½ per cent. that formerly applied has been withdrawn and the Board requests a duty of 1½ cents per lb. on copper rods, the same as now exists on ingot copper. The memorial also asks that scrap copper be placed in the copper item in the tariff, as huge stocks of scrap copper which were available in munition plants abroad, have been dumped into Canada at low prices, practically obliterating the market for new production in Canada. It is pointed out that for a large number of purposes, scrap copper is quite as good as the virgin. The memorial further requests that for the same reasons, scrap zinc and scrap brass be added to the tariff items on zinc and brass. In conclusion, the Board requests that a duty be placed on fluorspar entering Canada, which at present is without any protection, and which recently has been imported from Europe in face of the fact that Canadian fluorspar mines are closed down. Copies of the Trail Board memorial are being sent to every public body in British Columbia for endorsement.

Silver.—On Thursday, September 22, silver rose to the highest price mark of the year, when the London price was 41½d., the New York 68⅝ cents per ounce. Adding the ruling premium on New York funds the price to Cobalt mines was 76 cents an ounce. Increased buying from India and China is mostly responsible for the increase. The lowest New York price for this year was on March 5th, when 52⅝ was quoted.

Silver production has of course, as a result of poor business conditions, been curtailed very greatly this year. A world survey indicates that only 60 per cent. of last year's total is being mined. Latest wires from New York quote Canadian silver at 70⅝ cents, the highest of the year.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals and Industrial Minerals.

Inorganic.

Alum, Ammonia, lump and ground	100 Lbs.	4.75— 5.25
Ammonium Bromide	Lb.	.. — .45
Aluminium Sulphate, high grade, bags	100 Lbs.	.. — 4.00
Ammonia, Aqua 26	Lb.	.11— .12
Ammonium Carbonate	Lb.	.10— .20
Ammonium Chloride	Lb.	.08— .15
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .14
Barium Sulphate (Barytes)	Per Ton	30.00—35.00
Barium Chloride	Lb.	.05—.07½
Barium Nitrate	Lb.	.. — .20
Barium Peroxide	Lb.	.. — .20
Barium Sulphate, B.P.	Per Ton	100.00—110.00
Battery Acid, up to and including 1.400 sp. gr.	Cwt.	3.00— 3.50
Battery Acid, over 1.400, up to and including 1.835 sp. gr.	Cwt.	3.50— 4.00
Bleaching Powder, 35% drums	100 Lbs.	.04½— .05
Borax, crystals	Lb.	.. —.07¾
Boric Acid, powdered	Lb.	.. — .18
Bromine (technical)	Lb.	.. — .38
Calcium Carbide, car lots, f.o.b. works	Ton	.. —100.00
Calcium Carbide, ton lots, f.o.b. works	Ton	.. —105.00
Calcium Carbide, less than ton lots, f.o.b. works	Ton	.. —110.00
Caustic Soda, ground, drum	Cwt.	6.25— 6.75
Caustic Soda, solid, drum	Cwt.	5.25— 5.75
Calcium Chloride, fused	Per Ton	50.00—55.00
Camphor Monobromate	Lb.	.. — 3.00
Carbon Bisulphide, in drums	100 Lb.	.. — .10
Carbon tetrachloride, drums	Lb.	.17— .19
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	30.00—40.00
Cobalt Oxide, black	Lb.	.. — 2.50
Cobalt Oxide, grey	Lb.	.. — 2.80
Copperas (Iron Sulphate) crystals	Lb.	.02—.02¼
Copperas (Iron Sulphate) sugar	Lb.	.02—.02¼
Copper Sulphate (Blue Vitriol)	Lb.	.07½—.08½
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — 1.45
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fuller's Earth, car lots, f.o.b. Toronto	Ton	35.00—40.00
Ferric Chloride, crystals	Lb.	.13—.14¼
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid, 60%	Lb.	.. — .30
Hydrofluoric Acid, 30%	Lb.	.. — .14
Hydrochloric Acid, carboys, 18	100 Lbs.	2.75— 3.00
Hydrogen Peroxide	Gal.	.95— 1.00
Iodine, crude	Lb.	.. — 4.75
Iodine, resublimed	Lb.	.. — 5.20
Iron Oxide (red)	Lb.	.05— .13
Lead Acetate	Lb.	.16— .17
Lead Nitrate	Lb.	.16— .18
Lime, grey	Ton	.. —16.50
Lime, grey, in car lots	Ton	.. —14.00
Lime (hydrated) in ton lots	Ton	.. —23.25
Litharge	Lb.	.. — .10
Lithium Carbonate	Lb.	.. — 1.70
Lithopone	Lb.	.07— .08
Magnesite, calcined	Per Ton	25.00—30.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.13— .16
Magnesium Sulphate	Lb.	.03½—.04¼
Mag. Sulphate, B.P., Medicinal...Single	Ton	70.00—75.00
Mag. Sulphate, Technical, car lots	Ton	55.00—60.00
Muriatic Acid, 18	100 Lb.	2.75— 3.00
Nickel Salt, single, in bbl. lots	Lb.	.. — .15
Nickel Salt, single, per cwt.	Lb.	.. —.16¼
Nickel Salt, double, in bbl. lots	Lb.	.. — .15
Nickel Salt, double, per cwt.	Lb.	.. —.16¼
Nitric Acid, 36 carboys	100 Lb.	.09—.09¼
Phosphoric Acid, 85%	Lb.	.43— .50
Phosphoric Acid, 50%	Lb.	.29— .31
Phosphorus, yellow	Lb.	.. — .44

Potash Prussiate yellow	Lb.	.28— .30
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.20— .27
Potassium, Bromide, granular	Lb.	.20— .27
Potassium Bichromate	Lb.	.. — .30
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — ..
Potassium Chlorate	Lb.	.. — .12
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash)	Sticks	.. — .80
Potassium Hydroxide (caustic potash) small drums	Lb.	.10— .15
Potassium Hydroxide (caustic potash) large drums	Lb.	.07—.08½
Potassium Iodide	Lb.	.. — 3.55
Potassium Nitrate, kegs	Lb.	.18— .20
Potassium Permanganate, bulk	Lb.	.65— .70
...ipitate (Mercuric Oxide)	Lb.	. — 2.50
Silver Nitrate	Lb.	.. —10.00
Soda Ash, bags	Cwt.	2.90— 3.00
Sodium Acetate, ton lots or over	Lb.	.. —.06½
Sodium Acetate, lesser amounts	Lb.	.. —.07½
Sodium Benzoate	Lb.	.65— .75
Sodium Bicarbonate, 100% pure	100 Lb.	3.00— 3.50
Sodium, Bichromate, bbls.	Lb.	.11— .13
Sodium Bisulphite, powder	Lb.	.. —.09¼
Sodium Bisulphite, 35	Lb.	.05¼— .06
Sodium Bromide (foreign)	Lb.	.25— .30
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.. —.27½
Sodium Hyposulphite, kegs	100 Lb.	5.00— 5.75
Sodium Iodide	Lb.	.. — 4.00
Sodium Nitrate, refined	100 Lbs.	6.25— 7.25
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Peroxide, f.o.b. New York	Lb.	.38— .40
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	.. — 1.85
	Per Cwt. in Car Lots	.. — 1.75
Sodium Sulphite	Lb.	.. — .05
Sodium Prussiate, Yellow	Lb.	.14— .18
Sulphur, ground	100 Lb.	2.75— 3.50
Sulphur, roll	100 Lb.	4.50— 4.75
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.50— 3.00
Sulphuric Acid, 66 Be, tank cars		.. —24.00
Talc, No. 1 grade	Ton	.. —30.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	..—18.00
Tin Chloride, crystals	Lb.	30 — .35
Tri-sodium Phosphate	Lb.	.. — .08
Ultramarine, Blue	Lb.	.15— .40
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 2.70
Whiting (English)	Ton	.. —35.00
Whiting (American)	Ton	.. —30.00
Whiting	Per Ton	35.00—40.00

Zinc Sulphate, com.	Lb.	.05¾—.06½
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.9½—.10½
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.. — .55
Acetic Acid, glacial, carboys, f.o.b. Shawinigan Falls	Lb.	.. —.22½
Acetic Acid, glacial, bbls., f.o.b. Shawinigan Falls	Lb.	.. — .22
Acetic Acid, 28%, carload lots	Lb.	.. —.04½
Acetic Acid, 28%, 25 bbl. lots	Lb.	.. —.05¼
Acetic Acid, 28%, 15 bbl. lots	Lb.	.. —.05½
Acetic Acid, 28%, 10 bbl. lots	Lb.	.. —.05¾
Acetic Acid, 28%, 5 bbl. lots	Cwt.	.. — 5.85
Acetic Acid, 28%, 3 or 4 bbl. lots	Cwt.	.. — 5.90
Acetic Acid 28%, 1 or 2 bbl. lots	Lb.	.. — .06
Acetic Acid, 80%, carload lots	Lb.	.. — .12
Acetic Acid, 80%, 25 bbl. lots	Lb.	.. — .14
Acetic Acid, 80%, 15 bbl. lots	Lb.	.. — .15
Acetic Acid, 80%, 10 bbl. lots	Lb.	.. —.15½
Acetic Acid, 80%, 5 bbl. lots	Lb.	.. — .16
Acetic Acid, 80%, 3 or 4 bbl. lots	Lb.	.. — .17
Acetic Acid, 80%, 1 or 2 bbl. lots	Lb.	.. —.17½
Acetone, pure, drums or over	Lb.	.. —.19½
Acetone, pure, lesser amounts	Lb.	.. — .25
Aspirin, in 100-lb. lots	Lb.	.90— 1.05
Alcohol, Absolute Ethyl, case of 1 doz 1-lb. bottle	1-lb. bottle	.. — 2.15
Alcohol, Absolute Ethyl, in steel drums of 10 gallons capacity	Imp. Gal.	.. —15.00
Alcohol, acetone, bbls. or over	Gal.	.. — 1.05
Alcohol, acetone, lesser amounts	Gal.	.. — 1.35
Alcohol, pure, bbl., 65% O.P.	Gal.	.. —10.50
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 1.15
Alcohol, wood, 95%, half bbl. lots	Gal.	.. — 1.25
Alcohol, wood, 95%, lesser amounts	Gal.	.. — 1.30
Alcohol, wood, 97%, bbls.	Gal.	.. — 1.20
Alcohol, wood, 97%, half bbl. lots.	Gal.	.. — 1.35
Alcohol, wood, 97%, lesser amounts	Gal.	.. — 1.50
Amyl acetate, technical	Gal.	4.75— 5.25
Amyl acetate, pure	Gal.	5.75— 6.25
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — .90
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 1.40
Camphor, refined, slabs	Lb.	.. — 1.15
Camphor, refined, tal	Lb.	.. — 1.22
Carbolic Acid, white crystals	Lb.	.57— .75
Chloroform	Lb.	.55— .60
Citric Acid, domestic, crystals	Lb.	.65— .70
Coumarin	Lb.	.. — 6.00
Cream Tartar, 98%	Lb.	.25— .30
Dextrine, potato	Lb.	.. — .09
Dextrine, corn	Lb.	.. — .09
Ether, B.P. conc.)	Lb.	.. — .63
Ether, Sulphuric	Lb.	.35— .50
Formaldehyde, bbls. or over	Lb.	.. — .15
Formaldehyde, 200-lb. kegs	Lb.	.. —.19½
Formaldehyde, 100-lb. kegs	Lb.	.. —.20¼
Formaldehyde, 50-lb. kegs	Lb.	.. —.21¼
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	6.00— 6.25
Gallic Acid	Lb.	1.26— 1.75
Glycerine, C.P., single tin of 56 lbs.	Lb.	.. — .31
Glycerine, C.P., two or more tins	Lb.	.. — .29
Glycerine (pale straw) single tin 56 lbs.	Lb.	.. — .30
Glycerine (pale straw) two or more tins	Lb.	.. — .28
Iodine, resublimed	Lb.	.. — 5.20
Hexamethylenetetramine		1.10— 1.50
Oxalic Acid	Lb.	.19— .25
Oleic Acid	Lb.	.. — .23
Phenacetin	Lb.	3.10— 3.50
Phenolphthalein	Lb.	.. — 1.80
Pyrogallic Acid	Lb.	3.00— 3.50
Quinine	Oz	1.00— 1.10
Saccharin	Lb.	3.50— 4.00
Salicylic Acid	Lb	.. — .32
Starch, corn, ground, car lots	Lb.	.. —.04¼
Starch, potato, ground, car lots	Lb.	.. —.07¼
Stearic Acid, Double Pressed	Lb.	.15— .16
Stearic Acid, Triple Pressed	Lb.	.17— .18
Tartaric Acid, crystals or powdered	Lb	.39— .44
Tannic Acid, commercial	Lb.	.45— .65

Rubber.

The following quotations on rubber are in American funds. New York delivery:

Crude.

Para, upriver	Lb.	.. —.17¼
Caucho Ball, upriver	Lb.	.. — .12

Plantation Rubber.

1st Latex Crepe	Lb.	.. —.18½
Smoked Sheet	Lb.	.. —.16½

Scrap Rubber.

Boots and shoes	Lb.	.04— .05
Automobile tires	Lb.	.. — .01
Steam and fire hose	Lb.	.. —.01¼
Inner tubes, No. 1	Lb.	.. — .08
Inner tubes, No. 2	Lb.	.. —.05¾

Tanning and Dyeing Materials

Fustic Crystals	Lb.	.28— .32
Hematine Crystals	Lb.	.20— .26

Logwood Crystals	Lb.	.20— .30
Quercitron Liquid Extract	Lb.	.06¾—.07½
Liquid Sumac Extract	Lb.	.07½—.08½
Ground Sumac	Ton	70.00—72.00
Chestnut Liquid Extract	Lb.	.02¾— .03
Hemlock Liquid Extract	Lb.	.04½—.04¾
Quebracho Liquid Extract	Lb.	.04—.04¼
Quebracho Solid Extract	Lb.	.05—.05½
Liquid Blended Extract (Canadian)	Lb.	.04—.04½

Metals.

Aluminium, No. 1, 98-99%	Lb.	.. — .28
Antimony	Lb.	.. —.07¾
Brass, yellow ingots	Lb.	.. — .14
Brass, red	Lb.	.. — .16
Cobalt, metal	Lb.	.. — 3.50
Copper, electrolytic, small lots	Cwt.	.. —16.25
Copper, electrolytic, car lots	Cwt	.. —15.75
Copper, casting, small lots	Cwt.	.. —15.75
Copper, casting, car lots	Cwt.	.. —15.25
Gold, Pure	Oz.	23.00—25.00
Iron, Pig	Ton	.. —43.00
Lead, pig, small lots	Cwt.	.. — 6.00
Lead, pig, car lots	Cwt.	.. — 5.50
Magnesium, ribbon	Oz.	.. — 1.50
Magnesium, ribbon,	Lb.	.. —18.00
Magnesium, powder	Lb.	3.00— 3.50
Mercury	Lb.	1.10— 1.25
Nickel, shot or ingot	Lb.	.. — .40
Platinum, pure	Oz.	85.00—90.00
Silver, bar, American silver	Oz.	.. —.99¼
Silver, bar, Canadian produced, U.S. funds	Oz.	. —.70⅝
Steel, mild, ¼ inch, base price	Cwt.	.. — 5.75
Steel, mild, 3/16 inch, base price	Cwt.	.. — 6.25
Steel, nickel, in bars, 3½% nickel	100 Lbs.	.. — 7.00
Steel, sheet, Bessemer, 28 gauge	100 Lb.	8.15— 8.50
Tin	Lb.	.. — .37
Zinc, sheets	Lb.	.. — .20
Zinc (spelter) small lots	Cwt.	.. — 6.75
Zinc (spelter) car lots	Cwt.	.. — 6.25

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. — .31
Motor Gasoline (service stations)	Gal.	.. — .35
Lighting Gasoline	Gal.	.. — .38
Naphtha	Gal.	.. — .32
Coal Oil	Gal.	.. —.20½
Fuel Oil	Gal.	.. — .08
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 1.00
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 2.25
Crude Creosote Oil, bbls.	Gal.	.. — .40
Refined Creosote Oil, bbls.	Gal.	.. — .65
Crude Coal Tar	Bbl.	.. —10.25
Refined Coal Tar	Bbl.	.. —11.50
Coal Tar Pitch, bbls.	Cwt.	.. — 2.15
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52— .57
Dip Oil, 20 per cent.	Gal.	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .10
Naphthalin Balls	Lb.	.. — .11
Alpha-Naphthylamin	Lb.	.. — .51

Flotation Oils and Naval Stores.

Rosin, Grade G, in 280 bbl. lots		.. — 9.00
Rosin, Grade W.W., in 280 bbl. lots		.. — 9.50
Turpentine, spirits, single bbls.	Imp. Gal.	.. — 1.07
Turpentine, spirits, 5 to 6-bbl. lots	Imp. Gal.	.. — 1.06
Turpentine, spirits, 5-gal. container	Imp. Gal.	.. — 1.22

Waxes, Gums, Vegetable and Essential Oils.

Essential Oils—

Cedar, leaf	Lb.	.. — 2.00
Cedar, wood	Lb.	.. — 1.15
Camphor	Gal.	.. — 6.75
Camphor, white	Lb.	.. — 1.00
Peppermint, American	Lb.	.. — 5.50
Peppermint, re-distilled, B.P.	Lb.	.. — 3.50
Peppermint, Japanese	Lb.	.. — 3.25

Vegetable Oils—

Anise Oil	Lb.	.70— 1.00
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .21
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .19
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.30— .32
Corn Oil, in bbls.	Lb.	.. — .10
Corn Oil, tank cars	Lb.	.. — .08
Cottonseed Oil, crude, f.o.b. Mississippi Valley points	Lb.	.. —.05¾
Cottonseed Oil, crude, f.o.b. Texas points	Lb.	.. —.05½
" Oil, summer yellow, f.o.b., Chicago	Lb.	.. — .07
" Oil, winter yellow, f.o.b. N.Y.	Lb.	.. — .08
Linseed Oil, raw, single bbls.	Imp. Gal.	.. — .97
Linseed Oil, raw, 3 to 5-bbl. lots	Imp. Gal.	.. — .96
Linseed Oil, raw, 6 to 9-bbl. lots	Imp. Gal.	.. — .94
Monopole Oil	Lb.	.. — .30
Olive Oil, foots, at Toronto	Lb.	.11½— .12

Gums—

Indian, No. 1A	Lb.	.. — .40
Indian, No. 1	Lb.	.. — .38
Tragacanth, No. 1, Ribbon	Lb.	.. — 4.50
Tragacanth, No. 1, Flake	Lb.	.. — 3.50
Tragacanth, Turkey	Lb.	.. — 3.75
Arabic, clear amber sorts	Lb.	.. — .18
Arabic, regular grain No. 4 and No. 5	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22¼
Arabic, white sorts	Lb.	.. — .40
Arabic, powdered, No. 1	Lb.	.. — .25
Arabic, powdered, No. 2	Lb.	.. — .24

Waxes—

Beeswax, various grades	Lb.	.39— .51
Paraffin, 128°—130°, M.P.	Lb.	.. — .22
Paraffin, 118°—120°, M.P.	Lb.	.. — .19
Paro Wax, blocks	Lb.	.. — .20
Shellac, T.N.	Lb.	.. — .84

Fertilizer Materials.

Acid Phosphate	Ton	.. —30.00
Animal Tankage, per unit of Ammonia		.. — 2.00
Animal Tankage, per unit of Bone Phosphate of lime		.. — .10
Nitrate of Soda	Ton	.. —75.00
Muriate of Potash	Ton	.. —75.00
Pure Ground Blood, per unit of Ammonia		.. — 2.25
Steamed Bone Meal	Per Ton	.. —45.00
Sulphate of Ammonia	Ton	.. —65.00

C. P. Chemicals.

Ammonia, C.P.	Lb.	.. — .27
Hydrochloric Acid, C.P.	Lb.	.. — .16
Nitric Acid, C.P.	Lb.	.. — .24
Sulphuric Acid, C.P.	Lb.	.. — .15

Industrial Gases.

Hydrogen (cylinders)	per 100 cu. ft.	1.00— 1.50
Oxygen (cylinders)	per 100 cu. ft.	1.40— 2.50

CANADIAN CHEMISTRY AND METALLURGY

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P. F. McCLEARY, Associate Editor. T. LINSEY CROSSLEY, Editor. L. E. WESTMAN, Business Manager.

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FROM THE PUBLISHERS

The Canadian Institute of Chemistry is the only organized body of professional chemists in Canada, which has a corporate entity. It stands for chemical and professional progress here and represents Canada in International chemical affairs. One hundred and eighty-two of the leading chemists in Canada are members, nearly all of this number being Fellows. Probably as many more are not. If you are one of this latter class, you are neglecting your duty to the profession as a whole. You should be supporting your fellow chemists and yourself by taking some part in this distinctly national organization.

There are various degrees of membership, suitable to the attainments of all, from students to chief chemists and university heads. The complete working-out of the objects of the Institute would bind each and every qualified chemist in Canada in one strong organization, which would have the maximum influence in industry, government and all professional matters relating to Canada.

Ample proof of the value of professional status is obtained through the history of such bodies as the Institute of Chemistry of Great Britain and Ireland and the American Institute of Chemical Engineers. Membership in these bodies has been made to stand for something. Likewise will membership in the Canadian Institute indicate the highest ranking of a professional chemist in Canada.

Students from our universities are beginning to see this and are becoming student members, looking forward to the time when they will become full Fellows of the Institute, entitled to the designation of F.C.I.C. There are, however, still many chemists who have arrived and although very eligible for membership, have neglected to join. The Institute will shortly publish a list of its members and we believe there are very few non-members who would not be benefited by being listed. The door is very wide open and will remain so for all qualified men.

Put a self-starter on your machine and do this thing, that you may have intended to do for so long. Self-starters are in demand these days, so let the Secretary hear from you without delay. Each member can help, by expanding this community of interests among his friends.

Let no one say that you are retarding the professional progress of Canadian Chemistry.

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EDITORIALS

CANADIAN CHEMICAL EXPORT PROBLEMS.

WE are face to face here with some very stern conditions. In spite of the fact that from the economic standpoint, Canada is a desirable place to manufacture certain chemicals, those world wide forces now acting to protect national industries within the state in which they exist, make it most difficult for us to hope for much business in some lines.

Those Canadians over sixty years of age may remember conditions somewhat similar. At that time there was a desperate effort made to stimulate business in the United States without any regard to what happened elsewhere. Our raw products were hit hard. Now the United States, while still protecting producers of raw materials, is not quite so well situated. They are, however, protecting their technical or specialized industries and we see no particular reason why they should not.

The home market in Canada will be a good steady growing one, and if we can avoid undue expansion, existing companies should enjoy prosperity if reasonable proteeton is maintained. In the chemical field the United States may easily "cut off their nose to spite their face" as far as Canada is concerned. Canadian manufacturers have bought chemicals and special machinery from the United States up to at least 80% of their requirements, and more at times. These can be secured elsewhere if need be and at equally good prices, although the whole buying trend is to the South as it should be if walls were not erected to prevent it.

H. W. Matheson in a recent article to "Chemical Age," New York, put the matter very clearly as far as acetic acid and carbide are concerned. In these particular instances it does seem that the United States market might be left open to Canadian producers at least until our exports compare in some way with our imports. A duty of $20 a ton on carbide and $40 on acetic acid as proposed, might just as well be twice as large. It is sufficient to stop all imports. Mr. Matheson places the situation very clearly in the following paragraph:

"Canada imports at the present time $30,000,000 worth of chemicals from the United States, which amounts to 90 per cent. of the total chemicals imported into Canada. If we exclude explosives and cyanamide the total chemical materials exported from Canada to the United States amount to only $10,000,000, which amount is a negligible quantity compared with the enormous production of the United States, and small in comparison with the United States exports to Canada."

"The result of the new tariff bill will be to cut our exports in chemicals to the United States to the vanishing point. The tariff now proposed is, to the mind of the Canadian manufacturer, not one of protection for home industries but one of absolute exclusion of our products. Most certainly, in so far as the products above mentioned are concerned, their exportation to the United States from Canada under such tariff regulations is impossible."

"It is not the writer's opinion that the United States, under present conditions, can lower advisedly her tariff walls. It is conceded readily that a moderate amount of protection is desirable and necessary, especially for infant industries. It is difficult, however, to conceive why such industries as wood distillation which is native to the United States and in which she controls about 70 per cent. of the world's production, and the carbide industry which is now practically a monopoly of one company, should require a protective tariff so high as to exclude all foreign products, whereas the infant dye industry is refused a measure of protection commensurate with its transcendent importance."

"The argument of the German menace, which applies most particularly to the dye industry, is the one advanced, but those familiar with the German industry know that Germany lacks waterpower and that German carbide is of much inferior quality, due to the quality of her coal, that no competition need be feared from her in carbide or carbide products. Carbide also for many years has been on the free list, and no carbide or carbide product ever has entered the United States market from Germany. In any case American protection from German competition in carbide and all its products could be obtained by a provision relating to the importation of products from all countries favored by adverse exchange and depreciated coinage."

There are no two ways about it, Canadian manufacturers cannot if they would, continue to buy on the American market. Unless our exports to the United States equal our imports and bonds sold, exchange will remain against the Canadian dollar, and in the end American business will be the loser, as Canada can supply her needs elsewhere both for goods and to some extent capital, although it may take some time to create the connections. We believe that American manufacturers will assert them-

selves even yet, in the interests of a certain amount at least, of export business, or failing this, undertake the production in Canada of special materials.

WORKING IN THE OPEN.

FIRSTLY, a delightful Frenchman named Jouanneau, a papermaker, has been visiting Canada. Writing his impressions in the Pulp and Paper magazine, he has this to say:

> "First of all I consider it my duty to state that I was delighted with the reception which I was accorded by the Canadian paper industry. I was allowed free access to all the mills and was able to obtain all the information which I desired from the mills which I visited, without being subject to such restrictions as are imposed on visitors in certain European mills. Unfortunately I must admit that Canadian mills are easier of access than certain French paper mills, which is one of the reasons which induced me to continue my study of paper making abroad rather than in my own country. I was greatly surprised to see the co-operation which exists between most of the large Canadian mills. These mills keep continually in touch with one another, exchanging new discoveries as well as improvements effected in the equipment, even going so far as to exchange costs. By means of frequent technical meetings, their technical men have a chance to discuss all sorts of problems which make for a reduction in costs, increase in output, and improvements in the quality of the paper. Owing to this close co-operation, of which the Canadian Pulp and Paper Association is the moving spirit, the Canadian paper industry has grown in a hitherto unheard of manner, developing its equipment to the utmost, and succeeding in making a very good grade of paper at stupendous speeds and relatively low costs.

The writer is prepared to plead a little partiality for the pulp and paper industry, and is therefore pleased to note this complimentary allusion. There is, moreover, a principle of general application and great importance; that of the open-house-latch-string-out policy which is the evidence of democratization in industry—a sounder policy than socialization—that encourages individual enterprise, and harnesses our progress to the stars and not the moles.

Secondly, we visited the remarkable and edifying exhibition which was a feature of the recent convention of bread and cake bakers of Canada, noting there a growing spirit of co-operation. This is a promising change of policy.

The writer was once engaged by a baking company to visit and report on conditions in plant, but was forcibly ejected by a dusky six-foot Cerberus employed to keep out spies, who had not been informed properly as to my mission.

Perhaps the most important factor in this change of view is the development of research on the part of two large concerns rather curiously working with different objects in view; one to reduce the consumption of yeast, and one to increase its use, but both in close touch with all phases of baking, and employing highly scientific methods of research conducted by corps of trained technicians in thoroughly equipped laboratories, and publishing their findings.

In conclusion, many industries are emerging from their burrowing existence; there has been a steady penetration by standardization of equipment and methods. Research, then, not only enables individuals to attain economies, but raises all industries to a plane above the hocus-pocus and mystery engendered by selfish ignorance. This psychological phase has not been given the prominence merited by its deep-seated importance. If we could get the senators into our bakeries and paper-mills, we might raise them to higher altitudes, also.

SCREENINGS.

THE elevators at Port Arthur and Fort William are worrying that tons of screenings must be thrown into Lake Superior to make room for new wheat. Some portion of the large amounts recovered in cleaning wheat is used for cattle feeds, (which must, however, be labelled to that effect), but there remain large quantities for which no use is found. These screenings contain protein, oils and starches, and at some time will doubtless be considered valuable raw material in several industries.

The huge piles of anthracite screenings are now being developed by various means and may be regarded as havng been disposed of in prospect.

Pulp-mills produce screenings which in the past have been thrown away, but which now are used in increasing quantities for wrapping paper, cartons and boxboard. There are screenings of humanity—good material, badly handled.

It may not be practicable to get along without screenings, but their volume is far greater than it should be.

Wheat Screenings from bad seed, careless cultivation or failure to destroy weeds; Coal Screenings from poor methods of mining and shipping; Pulp Screenings from oversize chips or wrong cooking conditions; Human Screenings from bad housing, poor food and inequitable distribution of opportunity.

In all these cases the scientist can help. Little, however, can be done without the intelligent interest of the management. In the case of human screenings, that is the government.

Who ever wins in the coming election, we shall get the government we deserve as a nation. It is as much a part of the chemist to keep down the volume of human screenings as it is to reduce material screenings. Most of us have votes, let us make sure to use them, and to do so with appreciation of our responsibility. The screenings pile is large just now; the in-coming government must be of the type to reduce it with something other than the usual political methods.

UNKNOWN FORCES.

THE Oppau explosion seems destined for rating as another mystery. Possibly the blasting of the sulphonitrate of ammonia after being safely performed twenty thousand times—according to despatches—did finally liberate some super catalyst.

The probing of uncontemplated explosions presents difficulties inherent in the fact that imagination had not previously conceived the conditions. The writer once spent some days trying to reproduce in a small safety explosives plant a detonation which had caused a minor accident. It may be that the knowledge of what had happened prevented the carrying out of details with sufficient swing, but many repetitions of the same set of conditions failed to produce anything exciting, and the over-worked static discharge was debited again.

We are still dealing with the unseen and unsolved even in the best equipped of industrial laboratories. The construction and force balance of molecules have not yet been revealed. Canada should have that Research Institute in preparation for the time when some great international research programme shall call for representative scientists to operate an international, centralized laboratory to make better use of a small fraction of the present armament expense and bring nearer the time when natural forces shall be more safely harnessed.

POSSIBILITIES FOR BARIUM INDUSTRIES IN CANADA.

IT seems to be our practice to under-rate the value of Canadian business when it is suggested that we manufacture here, from our own natural resources, chemicals that we now import. For the year 1920, Canada exported paint to the value of $1,625,418. For the use of the paint and other industries we imported from U.S.A. alone

Barium Sulphate	$ 101,840
Barytes	52,634
Zinc White	1,455,079

Do not these figures suggest possibilities in the development of Canadian resources?

MARKING GOODS AS TO COUNTRY OF ORIGIN.

IT is by no means certain that the legislation whereby all goods coming into Canada must be marked with the name of the country in which they were manufactured, will work out in an entirely satisfactory manner. No doubt it will be easy after the first of the year to stamp large pieces, but how about those many small and delicate articles used by chemists. One can visualize a customs appraiser breaking open shipments of glassware.

As a matter of fact there is grave doubt if such an act helps to develop Canadian business. Germany will probably laugh, as this is exactly what they want, and have done for years. It is good advertising and may well assist in creating a demand for foreign goods. This is not the idea of the originators, but is a very probable result. We believe the act will be short lived, or will be modified in a way which will soon make it a dummy regulation.

HOW WOULD THIS DO?

IN the reports of large industrial companies there are always set aside large sums for depreciation, obsolescence, and contingencies.

Would it not be a good idea to have a part of the surplus earnings set aside for progress and investigation? Or even use the income from these contingent funds for that purpose?

This would secure in many cases sufficient funds to cover the equipment and maintenance of laboratories and thereby remove them from the cockpit of cost and profit. No one department would have to carry the overhead whose charges are such a bone of contention in their allocation.

The carrying of funds for depreciation and obsolescence is merely a sort of vassalage to the junk pile. Progress and investigation are weapons to conquer that unsightly tyrant.

SET FAIR.

We have many reasons to believe that things are on the mend. We got into a group of purchasing agents the other day, and they seemed to think so. We have heard others say so, but when C. Emptor, Esquire, speaks in that way, we consider it decidedly encouraging.

CORRESPONDENCE

Canadian Chemistry & Metallurgy,
57 Queen St. W.,
City.

Gentlemen:—

The Dominion Government has recently passed an Act which goes into effect on the 1st of January and one which has an interest for users of chemical apparatus which perhaps at the moment they do not suspect. The act referred to is the one which requires that the country of origin to be clearly and permanently marked on all goods imported into Canada.

No one should take exception to this act in its general design and purpose. It has much in its favor and is after all only an elaboration of existing legislation. In the detail of its enforcement it will cause, if carried to the limit, and according to information gathered in reliable sources in Ottawa it will be carried to the limit, inconvenience and unnecessary expense and delay to all users of laboratory apparatus. For instance, it is understood, (the writer has reason to believe), that it is necessary to mark individually every item no matter how small or trivial. To do

this will add considerably to their expense without any special benefit to anyone concerned.

The operation of the act will effect another class of articles such as unframed lenses, various optical plates and pieces of apparatus used in teaching light by, interfering with their utility, if there is any mark upon them.

Another effect of the act will be in the examination of imported apparatus by customs officials where pieces of delicate apparatus are opened up for examination in the customs warehouse and re-packed. Very considerable risk of breakage will result, in fact, breakage is certain to be a serious item.

No trouble will be experienced in marking large pieces of apparatus such as balances, microscopes, spectroscopes and scientific instruments generally, but surely there is room for a practical modification of the act which will allow small and inexpensive articles and delicate glassware to come in unmarked. Surely a mark on the container will be sufficient to meet all requirements of the act. A great many of the miscellaneous items used in a laboratory, although simple in themselves, cannot readily be made in Canada, a fact which every user knows, so that in allowing such to come in unmarked no one suffers injury of any kind.

Unless prompt action is taken in this matter confusion and loss will result before the provisions of the act are made practical.

Yours very truly,

Toronto, Oct. 18, 1921 J. S. NEIL.

COAL PRODUCTION IN CANADA, FIRST SIX MONTHS, 1921.

ACCORDING to a report prepared by the Mining, Metallurgical and Chemical Branch of the Dominion Bureau of Statistics, the output of coal from Canadian mines during the first six months of 1921 declined to 86 per cent. of the amount produced during the corresponding period of 1920, but was 5 per cent. in excess of the output for the same period 1919. New Brunswick was the only province showing an output equal to the 1920 record, producing 104 per cent. of its 1920 production. The total value of coal shipped during the period from all Canadian mines was $32,882,953 and the average sale price ranged from $2.43 a ton for lignite coal in Saskatchewan to $8.53 a ton for anthracite in Alberta. The average for the Dominion was $5.75. The total production for the period was 6,783,060 tons divided provincially as follows: (figures in tons) Nova Scotia, bituminous 2,750,319; New Brunswick, bituminous 69,230; Saskatchewan, lignite 145,394; Alberta, anthracite 46,402, bituminous 1,261,080, lignite 1,125,312, total for Alberta 2,432,794; British Columbia, bituminous 1,385,323. With regard to importations from the United States, the report shows that Canada as a whole, imported 104 per cent. of the amount of anthracite coal imported during the same period of 1920, and 132 per cent. of the corresponding imports of bituminous. Central Ontario has imported during the first six months of the past three years a continually increasing amount of bituminous coal, the index numbers for the periods being 92% in 1919, 100 in 1920, and 115 in 1921. Total imports of anthracite and bituminous for the 1921 period were 8,319,246 tons.

Total exports of Canadian coal for the period amounted to 869,004 tons as compared with 1,278,957 tons in the same period 1920 and 948,495 tons in the same period 1919. British Columbia was the principal exporter, having shipped out 517,823 tons, representing 87 per cent. of the amount exported by the province during the same period 1920. The principal countries receiving exports of Canadian coal are United States, Great Britain, Newfoundland, Japan, Alaska, France, Gibraltar, Netherlands and Belgium.

THE CANADIAN GLASS INDUSTRY.

Owing to the fact that the Mining, Metallurgical and Chemical Section of the Dominion Bureau of Statistics has had an immense amount of organizing work to do since its inception a year or so ago reports from this Section sometimes appear comparatively late as to date. The public may not often appreciate the difficulties under which the Section labors. The year 1918 has been taken as the first to report on in most cases. Hence it is that the latest figures obtainable in complete form on the glass industry are for 1918. The products of the Canadian glass industry in 1918 were valued at the factories at $6,578,602, while imports into Canada for 1918 of glass and glassware were valued at $5,430,873, exports amounting to only $35,267. Nine plants were engaged in the manufacture of glass and glassware in Canada in 1918, with a total working capital invested of $7,443,525. The industry employed 2,215 workers. The industry used $2,056,739 of materials during the year of which the chief items were: soda ash, $635,068; limestone, $18,076; lime, $18,046; litharge and red lead, $17,764; arsenic (white), $8,694; boxes and cases, $367,946. The production of the industry included lamp and lantern chimneys, tumblers, bottles, and other pressed and blown glassware made by six firms; vials and chemical glassware by two others; and window glass by one firm only. Of the glass imports the largest item is for common and colorless window glass, $1,809,031; plate glass, $1,031,440; carboys, decanters, flasks, jars and phials, $657,113.

WORK OF THE ASSOCIATION OF BRITISH CHEMICAL MANUFACTURERS.

During the past year this Association has been most active in relation to three bills in the British House. The Dyestuffs Bill, the Safeguarding of Industries Bill and the Railways Bill. The Government now seeks the advice of the Association on all chemical matters, and their position is strong, although the Association is but five years old. The question of clearing up the smoke and noxious vapor nuisance is receiving consideration, and already much improvement is shown around London. In general ways, research has been assisted and the work of British chemical plant manufacturers has been encouraged. Standardization is the aim among the equipment manufacturers. The officers at present are: Rt. Hon. J. W. Wilson, M.P., Hon. President (succeeding Lord Moulton; R. G. Perry, Hon. Vice-president; Sir John Brunner, Chairman; Max Muspratt, Vice-chairman; Sir William Pearce, M.P., Hon. Treasurer.

MINING OPERATIONS IN QUEBEC.

The Department of Mines for this province has just issued a report for 1920. The asbestos industry is given in detail. Some 3,123,370 tons of rock were mined, which yielded 170,500 tons of merchantable fibre. Of this amount only 1,026 tons were rated as Crude No. 1, but this class alone was valued at $1,513,439. Total value of asbestos products was $14,749,048.

The report covers copper, sulphur ores, chromite, gold, silvers, molybdenite, zinc, lead, magnesite and building materials. The report is very complete and gives lists of operators of all mines.

Utilization of the Common Milkweed*

Results of Research—Possibilities of the Oil as a Paint Oil and of the Bast Fibre as Textile Material.

By ARTHUR C. NEISH and J. W. BURNS

In some preliminary experiments performed by one of us† the following suggestions and possibilities were noted:

(1) Utilization of the bast fibre as a textile material.

(2) Utilization of the oil from the seeds as a paint oil.

(3) Utilization of the coma as a filling for matresses, pillows, etc.

In the work undertaken the separation of the seeds from the pods and the coma was a matter of considerable difficulty, but good results were attained by making a machine almost the duplicate of that used in separating Kapok from its seeds.

The seeds were screened to remove the pods, and then ground to a fine meal before extraction.

The coma was separated from the pods by an air blast, as the coma is very light, while the pods are comparatively heavy.

The pods were picked before being fully ripened, and were allowed to dry and ripen indoors.

Two varieties of the milkweed are found in quantities in Canada, *Asclepias Syrica* and *Asclepias Tuberosa*. Each was studied and it may be stated that the properties are in general the same. In the case of *A. Tuberosa* the fibre is of a much better grade, being longer, less brittle, and more readily detached from the woody stem.

One fact stands out in the study of this plant, namely, the effect of climatic conditions and the nature of the soil. The summer and fall of 1920, in the vicinity of Kingston, Ont., was rainy and there was also a large number of foggy days. This fact caused the pods to ripen slowly and consequently the yield of oil was about 40% of what it was the year before. The quality also deteriorated greatly. The weather also caused the fibre to be very brittle and weak, making it practically worthless as textile material.

Soil conditions seem to affect the fibre and oil to a marked extent. Limestone soil gives a plant with a brittle bast fibre, very strong and white. The oil has an iodine number of approximately 130, with an average yield of 12%. Sandy soil gives a plant with a flexible weak fibre and the oil has an iodine number of approximatety 142 with a 22% yield. Clay soil gives a plant with a poor fibre and a seed with a small oil yield of poor quality.

The oil was studied and the following is a summary of the results obtained:

The oil contains glycerides of linoleic acid, linolenic acid, and isolinolenic acid. There are also present glycerides of oleic and archaidic acids. The exact per cent. composition was not found as the different samples had varying compositions, according to quality of seed and the nature of the soil.

The oil was extracted with petroleum ether chiefly. We tried to have some pressed, but were unable to secure a small enough press for the quantity of seeds available.

*The authors were able to conduct this research owing to the financial assistance in the form of a Studentship given by the Research Council of Canada. Mr. Burns was the holder of this studentship for the year 1920-21.

†Milkweed—Arthur C. Neisb, Soc. Chem. Ind., Jan., 1913.

The yield varied considerably and the following is a list of yields from various sources:

	Oil content	
1920 (good seeds)	28%	*A. Syrica* and *A. Tuberosa*
1920 (poor seeds)	8%	*A. Syrica* and *A. Tuberosa*
1920 (average seeds) ..	22%	*A. Syrica* and *A. Tuberosa*

A. Syrica.

	Oil content.
1921 Limestone soil	9%
1921 Sandy soil	13%
1921 Clay soil	4%

A. Tuberosa.

	Oil content.
1921 Sandy loam	14%
1921 Swamp soil	18%

The constants were determined on a mixed oil in the case of 1920 and on each of the oils in the case of the 1921 samples.

A. Syrica.

1921.	1. Limestone soil.	2. Sandy soil.	3. Clay soil.
Boiling Point..........	Decomposed	Decomposed	.....
Solidifying Point	24° C.	25° C.	170° C.
Sp. Gr.	.9351 at 15° C.	.9361 at 15° C.	....
Saponifaction Number .	184.9	183.1	178.2
Iodine Number	129.8	142.3	106.1
Refractive Index	1.4738	1.4758	1.4716
Acid Value	17.81	6.51	26.41
Reichert Meissel	1.71	1.01	.....
Insoluble Bromide	1.6%	5.81%	1.1%
Viscosity	214.2 seconds at 70° F.	209.1 seconds at 70° F.	212.8 seconds at 70° F.
Saponification equivalent	307.6	....	....
Acetyl value	9.12	5.86	9.61

1. Oil is brownish green and contains considerable proteid matter.

2. Oil is yellowish with slight trace of green. On filtering through Fullers' earth the color becomes a golden yellow.

3. Oil is olive green and contains a large amount of proteid matter. When the oil is centrifuged, this separates and the properties seem to be such as are required of a good adhesive.

A. Tuberosa.

1921.	(1) Sandy Loam.	(2) Swamp Soil.
Solidifying Point	22° C.	24° C.
Sp. Gr.	.9359 at 15° C.	.9361 at 15° C.
Iodine Number	141.8	141.6
Refractive Index	1.4756	1.4755
Acid Value	6.61	7.11
Insoluble Bromide	6.12%	5.88%
Viscosity	208.6 seconds at 70° F.	209.1 seconds at 70° F.
Acetyl Value	5.91	5.88

1. The oil is a golden yellow with a pleasant characteristic odor.

2. The oil is a golden yellow with a little or no proteid matter.

A. Tuberosa.

1920.	Average Seed.
Boiling Point	Decomposed
Melting Point	21° C.—25° C.
Sp. Gr.	.9359 at 15° C.
Solubility	Soluble in most solvents eacept water and alcohol.
Saponification Nnmber	183.7
Iodine Number	143.0 —145.0
Refractive Index	1.4752— 1.4756

Acid Value	16.35
Reichert Meissel	1.67
Insoluble Bromide	4.3%—6.1%
Viscosity	210.7 seconds at 70° F.
Saponification Equivalent	304.7
Reichert Value	0.73
Insoluble Chloride	2.51%
Bromine Thermal Value	24.6° C.
Maumene Value	96.1° C.
Acetyl Value	7.87

Extracted oil is greenish yellow and the pressed oil golden yellow. The odor and taste of the pressed oil is pleasant.

Drying Properties, 1920—(Mixed Oils.)

Livache's Test—

Extracted Oil—gain in weight in 72 hrs.—4.3%.

Pressed Oil —gain in weight in 72 hrs.—7.7%.

Elaidin Reaction—yields a mass having two layers, one gummy and the other oily—20% was of a gummy nature.

Sulphur Chloride—rubbery mass, insoluble in ether.

In order to compare with linseed oil, one gram samples of each oil were placed on a number of glass slides and heated at 108 °C. for 6, 12, 18 and 24 hours, and the results noted were:

Oil.	6 hrs.	12 hrs.	18 hrs.	24 hrs.
Linseed	Soft skin	Soft skin	Hard skin	Hard skin
Milkweed	Thickened	Soft skin sticky	Hard skin very little strength	Hard skin brittle

Fifty grams of milkweed seed oil to which 0.5000 grams of Manganese Borate had been added was heated for 24 hours at 108 °C. with 600 c.c. of air per minute passing through. The oil darkened in color and thickened considerably. The product was dissolved in turpentine and the tests run as before.

	8 hrs.	12 hrs.	16 hrs.	20 hrs.	24 hrs.
Milkweed Oil	Hard skin, sticky	Hard skin, brittle	Hard skin, brittle	Hard skin, brittle	Hard skin brittle

The same experiment was carried out except the cobalt borate was used instead of manganese borate. The time was cut to 9 hours and the product was the same in properties as before.

Manganese dioxide, manganous sulphate, and manganous oxalate were tried as driers but were unsatisfactory. Manganese resinate and lineolate were very satisfactory as were the corresponding cobalt salts. The lead driers commonly used were not as satisfactory as the above.

Some finely divided lead added to the oil, caused, on heating, a product similar to "Artgum" in properties. As practically all of the lead was recovered the fact of polymerization and oxidization of the oil aided by a catalytic agent needs to be noted.

In the case of the 1921 crop the preliminary tests showed that the only oils of any value were those procured from *A. Syrica* grown on sandy soil, and those from *A. Tuberosa* The difference in properties of these were so slight that they were all mixed together.

Drying Properties, 1921—(Mixed Oils.)

Livache's Test—Extracted Oil—gain in weight in 72 hrs.—4.1%.

Elaidin Reaction—28% of a buttery gelatinous mass.

Sulphur Chloride—Rubbery mass, insoluble in ether.

The tests on drying in an oven were about the same as the oil from the previous year.

The production of an "Artgum" from the 1921 oil was not a success.

The tests of the oil show that it has not the properties needed for a good paint oil. The oil, however, was blended with linseed and it was found that in proportions from 10 to 20 per cent. by volume, it gives the linseed oil much greater elasticity and strength on drying. Some paints were mixed up from this mixture and dried. The wrinkling and bubbling sometimes noticed where linseed oil is used alone, were practically absent. A large number of tests were run by using this paint on varieties and qualities of wood, with the same result in each case.

This oil was also tried out in the making of varnishes. It is fairly satisfactory, but not as good as many of the other oils used. It can be blended, however, with the other, adding both strength and lustre.

The oil was blown as is done in the case of linseed and produced a gummy material much like that procured from linseed oil. The product secured was mixed with ground cork and various fillers and placed in a thin coat on canvas, rolled even and baked. The linoleum procured was fairly strong, but it was brittle. However, it is probable that under proper conditions of manufacture a good grade linoleum can be produced from this oil.

The thick viscid mass procured on prolonged blowing at a low temperature can be used as a base for printers' ink.

The seeds, after the oil was removed, were treated with "Fuller's Earth" in order to separate any glucosides and alkaloids from the coloring material in the seed.

Two glucosides, asclepione and asclepiadin were found in small quantities. These had been previously isolated from the root by other investigators, so no attention was paid to them except identification. Another glucoside belonging to the saponins was found, but owing to the small quantities available the composition formula was not obtained. It is very poisonous and in properties approximates very closely to a toxic glucoside found in asclepias galloides. It melts around 58°C. is insoluble in water, aqueous acids and alkalies, but is soluble in most of the organic solvents. It is colorless, brittle and slightly resinous and has not been crystallized.

It had been considered probable that the seed cake would make a good cattle food, but the finding of the poisonous glucoside renders this impossible.

Physical Characteristics of the "Coma."

The "coma" or down is the means used by the plant to scatter its seeds broadcast.

In order to procure this coma in the best possible conditions, the pods are picked just before they are fully ripe and allowed to dry slowly and evenly in a warm dry place. The coma is separated from the seeds and the pods by threshing, as mentioned before.

The coma varies in color from a pure lustrous white to a dull yellowish white. It is very soft and fluffy and fairly resilient. It is an extremely poor conductor of heat and could be well used for comfortables, quilts, etc. In this connection the following test was carried out. An 800 cc. beaker was carefully lined throughout with milkweed coma, so that in all parts there was an even layer 1½ inches in thickness. In the centre a space was made, large enough to allow a 75 c.c. beaker to be placed in it. In this beaker certain substances were heated to their boiling points, quickly covered with cardboard and placed in the prepared nest and covered with a layer of milkweed coma 1½ inches in depth. Readings were taken over the course of one half an hour in order to find the rate at which the heat was lost by radiation.

In order to secure some comparative data, tests were run on other insulating materials, such as cotton wool, sheeps' wools, fur from various animals. The insulators used in industry such as kiesel-guhr and magnesia were also used.

The following tables give the results of the representative tests. Fur approximates very closely to wool so it is omitted.

TEMPERATURE AT THE END OF ELAPSED TIME—IN MINUTES.

Material.	Weight in grams.	Temp. at start.	½	1	1½	2	2½	3	3½	4	4½	5	6	7	8	9	10	15	20	25	30
*Wool	87	148.3	147.0	146.0	145.1	144.2	143.3	142.4	141.6	140.8	140.0	139.2	138.0	136.8	135.5	134.2	133.0	127.0	123.7	118.8	114.5
Cotton	32	152.6	151.8	151.0	150.2	149.6	149.0	148.4	147.9	147.3	146.5	146.3	145.1	143.9	142.9	141.9	141.6	136.5	132.0	127.9	123.8
Milkweed ..	120	158.2	157.4	156.7	156.1	155.6	155.1	154.6	154.1	153.6	153.1	152.6	151.6	150.6	149.6	148.6	147.6	143.0	139.0	135.0	131.0
*Wool	87	65.1	64.8	64.3	64.0	63.7	63.4	63.1	62.8	62.5	62.2	61.9	61.4	61.0	60.6	60.2	59.8	58.3	56.8	55.3	53.6
Cotton	32	48.4	48.0	47.4	46.9	46.3	45.8	45.4	45.2	45.1	44.9	44.7	44.4	44.1	43.9	43.6	43.3	42.1	41.1	40.2	39.3
Milkweed ..	20	48.9	48.7	48.6	48.5	48.3	48.2	48.0	47.9	47.7	47.6	47.5	47.0	46.5	46.0	45.0	44.7	43.6	42.5	41.5	40.5
Keiselguhr ..	44	46.4	46.3	46.0	45.7	45.5	45.3	45.1	44.9	44.7	44.5	44.4	44.1	43.7	43.4	43.1	42.9	41.7	40.6	39.6	38.5
Magnesia ..	—	46.6	46.4	46.1	45.9	45.7	45.7	45.5	45.4	45.3	45.1	45.0	44.8	44.6	44.3	44.2	44.0	43.1	42.3	41.7	39.9

*Wool—Poor grade.

These tests go to show that it may also be used for sleeping bags, etc. One was made by Capt. W. L. Goodwin and used over a period of three weeks with success. This of course cannot be called very conclusive evidence of its utility, but gives some grounds for optimism.

From these experimental results it will be noticed that the coma is an extremely poor conductor of heat.

The coma seems to make a satisfactory filler for pillows, as it is very light, resilient, and can be readily shaken to loosen up the fibres. It does not go lumpy. A pillow was made and has proven satisfactory. The coma has a slight oil content which seems to protect it from water. This fact and also the fact that it is so very light led to some experiments in regard to the possible use of it in life preservers.

Canvas bags 3 in. x 5 in. were made and filled with the coma and then enough lead tied to the bag so that they would just float in distilled water. The results are given in the following table:—

	Weight of bag, in grams.	Weight of milkweed, in grams.	Weight of lead, in grams.	Time before sinking, hours.
Bag No. 270	18	14	235	52
Bag No. 220	18	23	275	55
Bag No. 285	18	11	165	40

Kapok, on the other hand, will support twenty times its own weight, but loses its buoyancy in a shorter time. In some of the experiments carried out bag sank in 34 hours.

The fibre is too short and brittle to be woven and any attempt to card it gives dust.

The coma is very resistant to decay, as the following experiment will show:—

Ten grams of the cleaned coma was placed in a beaker with ordinary water in a warm room and allowed to stand until the water had evaporated. The coma was then slowly dried in a damp room in order to give the molds a good chance. This process was repeated every week for three months. The coma was then removed, thoroughly dried and the resulting product had only lost 8 per cent. of its buoyancy, its color was only slightly darkened and the loss of weight was not appreciable. If the coma is allowed to stay in the pod attached to the seed it seems to be destroyed much more readily. The coma this year is of a very poor grade, owing to a very damp fall, which caused it to be darker in color and less resistent to decay. The buoyancy is also less than the average coma.

Chemical Properties of the Coma.

The fibre is composed of lignin and cellulose, lignin being dominant. Some estimations for cellulose were carried out, but the results were so varied that the estimations are not given in this report. The ash content varies from .9—1.48 per cent., of which .2 per cent. is phosphate. Some calcium occurs as well as traces of chlorides.

Botanical Characteristics.

Milkweed coma is 30—43 mm. long, light, brittle and fairly resilient. Its shortness and brittleness renders it unsuitable for spinning, but allows it to be used in other ways. The fibre consists of a single cell, cylindrical in shape, thicker at the base than at the tip, and thin cell walls, occupying about 1/10 of width of fibre. The cross section is oval or circular and the inner canal is partially filled with dried-up protoplasm. The walls of the fibre are somewhat pitted, although it seems to be a variable characteristic.

Another fact that has to be noted is that this material is extremely inflammable, so much so that a minor short circuit in our electrical connections caused a large proportion to be destroyed. If the material is tightly packed the surface layer burns and the fire seems to go no further. It gives a large amount of dust during the threshing.

The Bast Fibre and Its Characteristics.

The separation of the bast fibre from the stem and outside bark was carried out in three ways:

(1) THE RETTING IN A TANK. This work was carried out in a galvanized tank, painted on the inside with a waterproof enamel paint. The time of retting for maximum strength was found to be from 9 to 10 days with an average temperature of 65°F. In order to remove the fibre readily from the wood, the retting was allowed to carry on for 11 to 12 days. This caused the fibre to weaken and to become more brittle, but made the task of getting rid of the woody stem comparatively easy. After the retting was completed the stalks were taken from the tank, washed in clean water and allowed to dry partially, when they were passed between two grooved rollers which separated the bulk of the fibre from the wood.

It was found that if the time of retting was continued beyond 14 days a putrefactive bacteria caused the whole stalk to rot, so that no fibre could be obtained. The same thing occurs if the temperature raised much above 70°F. over a long period. If the temperature is below 60° the time of retting is increased 1 day for every 5°F.

It was found that the best fibre of *A. Syrica* this year was practically worthless as a textile material. The bast fibre of *A. Tuberosa* gives a good fibre, but we had very few stalks of it, and, while the results were satisfactory on what we had, it cannot be conclusively said that its use as a textile material will prove successful.

Another variety, *A. Incarneta*, gives an excellent fibre, but as we only had a few stalks of it no definite results can be given.

The bast fibre is white, strong and silky in lustre. In the varieties *A. Incarneta* and *Tuberosa* the fibre is flexible and long; in the other varieties it is a brittle and short and not suitable for anything as far as can be seen. The fibre can be readily bleached by ordinary bleach or weak permanganate. Both of these cause the fibre to soften and also cause a slight weakening.

(2) CHEMICAL METHODS. Two were tried extensively and tests run on a number of others, but all proved

failures, as the fibre was so weakened as to be useless.

(3) MECHANICAL METHODS. The green stalk was dried, passed through grooved rolls and the fibre removed. The fibre procured was coarse, very strong and only fairly brittle. It would seem to be a good material for cordage. The fine fibre is of course lost and so the mechanical process would likely prove to be a commercial failure.

A number of tests are being run on this plant at the present time, and if successful will be reported at a later date.

One of the writers, through the kindness of the Research Committee at Queen's, who paid all expenses, was enabled to visit the plant of the Dominion Linens at Guelph, and the plant of the Summer Linen Company, Port Huron, Mich. Every courtesy was shown him by these companies, and he wishes to express his appreciation of their kindness.

DEPARTMENT OF CHEMISTRY,
QUEEN'S UNIVERSITY, KINGSTON.

Sept. 21, 1921.

Canadian Graphite Situation

IN a paper before the Institute of Mining and Metallurgy at Montreal, V. L. Eardley-Wilmot reviews the graphite business in Canada. His connection is with the Quebec Graphite Co. of Buckingham, Quebec, as manager, and his remarks are, on the whole, fairly optimistic.

It is hopeful to know that at Calabogie, Ont., we have the Black Donald mine which is the largest and best grade deposit of graphite in America. The material has a microcrystalline structure and little "flake." Graphite mining in Canada is located all within 150 miles of Ottawa. At Buckingham, Quebec, the graphite is disseminated through metamorphic rocks, chiefly gneisses, crystalline limestones and schists. A probable solution for its formation would be to believe that the calcium carbonate had been changed to a lime silicate and the carbon dioxide reduced with the formation of graphite carbon.

Specifications of crucibles required are: the flake to not pass an 80 mesh screen; it must have 90 per cent. graphite carbon and be free from mica and pyrite.

Up to 1909 dry methods with large losses were used in recovering. In 1911, German engineers put in a completely wet plant for the Quebec Graphite Co., which consisted of rock crusher—wet grinding in Krupp ball mill—tube pebble mill—series of trommel screens—Ferraris type vibrating tables—hydraulic classifiers. The middlings were reground and concentrates sent to a vacuum filter. In finishing the presence of gritty material destroys the flake to a certain extent and is hard on the machine.

In 1908 oil flotation was introduced in the Graphite mills. The Plumbago Syndicate was the first to act in Canada and installed a Callow pneumatic oil flotation system near Buckingham, but the mill was burned down before results were available. The Consolidated Graphite Co., also in this district, attempted the floatation process but without much success, due mainly to the difficulty they had in refitting their mill. Early in 1919 the Black Donald Mine started the same process with good success and in the same year the Quebec Graphite Company followed. They report very satisfactory recoveries. The Spearman process has been introduced also in the Canadian field.

Marketing and Uses.

Mill capacity has probably been too large in the past, and poor systems of operation have accounted for the general difficulties of the business. Canadian ores are rich enough (10 to 20 per cent.) to warrant small mills properly run. Each one should have its special flow sheet because although a process may be known to work on one ore there is no guarantee that it will fit wherever you put it.

Crucibles are by no means the only outlet for Canadian Graphite. Canadian producers might well become larger manufacturers of lubricants, foundry facings, stove polish, and other graphite products. As bulk output has a bearing on complete manufacture of products, there would appear to be some opportunity for co-operation through consolidation in marketing graphite to ultimate consumers.

The Mines Branch using Callow cells produced with high recovery a No. 1 Flake, mica free, yielding a 90 to 92 per cent. graphite. From a chemical standpoint this was equivalent to Ceylon Graphite, but was inferior in physical properties as the flake was too thin. Attempts were made to produce a high grade flake without passing it through the finishing department with the result that a 87 to 90 per cent. concentrate was obtained, which was found very satisfactory for crucibles in the hands of Canadian manufacturers, but as yet has not obtained a hold in the United States owing to a natural prejudice and excessive stocks on hand.

In due time it is not improbable that Canadian companies will be able to market their own products, giving a stability to the business never previously obtained.

CENSUS OF GERMAN CHEMISTS AND CHEMICAL STUDENTS.

At the end of 1920, a census of German chemists resulted as follows:—Chemists, 2,571, of whom 38 were women. This compares with 2,688 in 1913. Chemical technologists were estimated at 727. Chemists who were business executives and owners of plants, 481. These figures are based on statistics from 501 firms. The report admits that there were still some companies classed as chemical which did not employ chemists, so that even in Germany chemists have not completely conquered industry.

During 1920 and 1921, students rated as going into chemistry or chemical technology at the universities numbered 6,787, as compared with 2,729 in 1912. The outlook for graduate chemists in Germany is not bright, according to Z. Angew, Chem.

BRITISH FIRM CONCLUDES AGREEMENT FOR RADIUM SUPPLY.

An announcement of great interest to those doing research medical work has been made, stating that the Imperial and Foreign Corporation of London, England, has concluded an agreement with the Czecho-Slovakian Government whereby the British company secures a commercial monopoly of the output of the state radium mines of Czecho-Slovakia. The yearly output of the Joachim Ethel mines, near Carlsbad, is about four grammes. Half of the output of the mines for fifty years shall belong to the company, who guarantees the capital for mine working, and the other half goes to the Slovakian Government for research work in their government laboratories.

Annual Report of Secretary-Treasurer, Canadian Institute of Chemistry

TO the members of the Canadian Institute of Chemistry assembled at the second Annual Meeting at Montreal, August 29, 1921.

This report deals with the development of the Institute from the date of the last report, namely May 28th, 1920, to the present time.

Future reports will, according to the By-laws, deal with the balance of this year, and annually from January to December thereafter.

The activities have been represented by, the Examining Board, composed of Messrs. Ruttan, Baril, Acton, Bain and Roast; the Employment Bureau; the scrutineers of Ballots, Messrs. Ruttan and Cook; and a special Committee on "The Remuneration of Chemists," in connection with which Mr. Cook was asked to provide information.

The Examining Board has dealt with 17 applications for Fellowship, and 18 applications for Associateship, in addition to which 4 applications were refused. Five of the applications received for Fellowship were reduced by the Board to Associateship. The Secretary would like to state for the benefit of the members that the Examining Board makes the most careful investigations of the applications received and that there is no doubt that such a policy will go far in keeping up the high standard of the Institute. It has been decided that any Chemist in England, who has been refused by the British Institute, shall not be accepted by the Canadian Institute.

Membership

The membership as at this date is:

Honorary Fellows	1
Fellows	156
Associates	22
Students (none registered)	0
Total (Active Members)	179

Several applications have been received during the last few days, so that probably another six or seven members will be elected in the near future.

The geographical distribution of the members is as follows: Alberta, 2; Argentine, 1; British Columbia, 7; England, 2; Kingston, 7; Montreal, 43; Manitoba, 8; Nova Scotia, 6; New Brunswick and Prince Edward Island, 3; Ottawa, 19; Ontario (less Toronto, Ottawa, Kingston), 26; Quebec Province (less Montreal), 11; Shawinigan Falls, Que., 3; Saskatchewan, 3; Toronto, 27; United States, 11; Total, 179.

Four members resigned during the year and seven were removed from the roll of the Institute for non-payment of dues. In this connection, it should be stated that five letters were written these seven members courteously, asking them to check the statement of the register of the Institute and to inform it if there were any errors in regard to their standing. No answers were received from any of these members, who, strictly speaking, owe the Institute the fees for the current year. There being no reason given for the non-payment of dues, the Institute can form no idea as to the reason therefor.

The Institute has lost through death two members, namely Dr. St. George, and P. E. Walsh, Esq. The passing of Mr. Walsh was particularly sad, as he had no relatives or near friends to attend him during his illness in Montreal. The Institute was able to visit him several times, and, with the co-operation of another gentleman, to attend to some things that pressed upon his mind at that time.

During the spring, the question of student membership was taken up, the same having been brought to the attention of the Institute by two Universities and several members, who thought that much good might be done the profession if provision were made for the younger chemists. After careful consideration, the Council decided in favor of student membership, and the same is now incorporated in the By Laws. At the same time, that Student membership was decided on, provision was made for Branches of the Institute and regulations governing such branches were drawn up. Provision was, of course, made in a general way for branches in the original objects of the Institute.

Queen's University immediately got busy and held several meetings, as Queen's Branch of the Canadian Institute of Chemistry; unfortunately, up to date, no list has been sent in to the Secretary as to the names of those participating. The real start of student membership and of branch activities will be this autumn, when it is hoped that a number of student members will be enrolled and branch activities begin in each of the large centres.

Members in Toronto arranged a special meeting, to which all in the vicinity of Toronto were invited. Good papers were read, and a pleasant time spent. The more of such meetings that can be held, the better for the life and influence of the Institute.

Further reference will be made at the close of this report in regard to the Student Membership and Branch activities, under the heading of "Recommendations."

Employment Bureau.

Turning now to the second activity of the Institute, namely the Employment Bureau. the following is to be reported:

78 Chemists have used the Bureau and 17 Companies have done likewise. The correspondence in this connection is represented by some 270 letters, written by the Institute.

10 Chemists have secured positions, the lowest salary having been $125.00 a month, and the highest $200.00.

At the present time, positions are vacant for two teaching posts in Universities and one in a works laboratory. Those on the employment list have been notified, but the positions have not yet been filled, so far as the Bureau is aware. One of the important Commissions sent a member to interview the Bureau, soliciting its aid in securing the services of a trained man at a salary of $7,000.00 a year for three years. Recommendations have been made to the Commission, but this matter also is not yet decided. We mention this as showing that the Bureau is gradually getting to be recognized as the centre for professional service, not only for the smaller positions, but also for the biggest. Further reference to the Employment Bureau will also be made under "Recommendations." At one time, there were over 60 names carried on the employment list; at this stage a circular letter was sent out to the applicants, stating that we desired to know if they still wished to be listed, and that unless they notified us in writing, their names would be deleted. This resulted in reducing the list to 25, showing that many had secured

employment in other spheres than chemistry, while others had moved and not left a forwarding address. Owing to the number on the list, the Bureau adopted the following procedure—namely, that the first to be notified would be members of the Institute, after these Canadian chemists, and lastly chemists outside of Canada.

It is a noteworthy fact that at no time has there been more than three members of the Institute out of a position and that only five members have nofified us that they were unemployed. This would seem to show that the standing of members is such as to command recognition as being essential factors in the successful working of the various institutions in which they are employed. It is generally recognized that the present very dull times are beginning to give place to greater activity and that by the end of next spring we shall have entered upon a period of steady improvement which should last many years.

We feel from the numerous interviews had in Montreal, sometimes six in one day, that the Institute has an opportunity to help and sometimes advise the younger Chemists who are constantly looking for jobs. The fraternal side of the Employment Bureau might well develop to the benefit of the profession, apart from the mere securing of positions.

The Scrutineers of ballots reported on the Ballot for the members of Council and later the Council so elected voted on the offices of President, three vice-presidents and Secretary-Treasurer.

Duration of Council.

Owing to the change of residence of one member and an error in the number of Council elected which led to the voluntary resignation of another and to the fact that the membership at large may not clearly understand who are the officers at this time, nor what their term of office, it was thought well to incorporate in this report a re-statement of the officers as at this time. A ballot sent out to all members in April, 1921, resulted in the unanimous vote in favor of the extension of the then terms of office of the members of Council for another additional year. As was explained at the time this was deemed necessary by our legal advisor in order to facilitate Incorporation Procedure.

President—Professor J. Watson Bain, who will have held the position for three years by next May, and who will automatically retire at that time, not being eligible for re-election until the lapse of one year, but remaining as one of the two immediately surviving past presidents, a member of Council.

Vice-Presidents—Dr. Harold E. Bigelow who retires in May next. Dr. George Baril who retires in May next. Prof. A. Lehmann who retires in May 1924.

Members of Council—J. A. McD. Dawson; Dr. R. F. Ruttan; Harold J. Roast; L. E. Westman, all of whom retire as members of Council in May 1924. E. G. R. Ardagh; I. C. Mackie; W. Lash Miller; Matthew A. Parker; Dr. J. S. Bates, all of whom retire in May, 1923. S. J. Cook; Dr. S. Basterfield, both of whom retire in May, 1922.

Remuneration Committee.

Mr. Cook who was appointed by Council to look into the important question of the remuneration of chemists has sent in a report which will be read later.

Empire Associations.

Among items of particular interest that have been handled in the office of the Institute might be mentioned the correspondence that occurred during the year between the South African Chemical Institute, formerly the Association of Analytical Chemists of South Africa. The South African Chemical Institute was founded in 1912 and at December, 1920, numbered 89 full members and 22 Associates. Through the courtesy of their Council we have been supplied with a complete set of their Proceedings and of their Journal, and have reciprocated on our part in like manner as far as we were able.

Similar correspondence has been exchanged with The Indian Institute of Science, Bangalore, India, and in the next Indian mail we hope to receive their publications, we having already sent out data to them.

An application has been received from New Zealand and this may possibly lead us to a more definite knowledge of the organization of Chemistry in that Colony.

It is felt that the strengthening of the bonds between the Chemists in the various parts of the Empire is something that is well worth cultivation and any opportunities along these lines should be carefully developed.

Similar relations are being established with the Chemical Society of Belgium, of which Mr. Wauters is Secretary, address 83 Rue Souveraine, Brussels, Belgium.

International Chemical Union.

In the last report made at the annual meeting in May, 1920, it was stated that Professor Parker was going to Rome to represent Canada through the medium of the Institute at the then Inter-Allied Chemical Union. Unfortunately through difficulty in the obtaining of passports he was unable to attend. This year we were more fortunate in that Vice-President, Dr. Georges Baril, was able to attend the Congress of the now International Chemical Union which was held in Brussels last June. The money voted by the Advisory Council as a contribution to these expenses was used for the trip of Dr. Baril, who owing to his being in Paris on personal business, kindly charged the Institute with only his very modest personal expenses at Brussels, making the cost to the Institute negligible. As Dr. Baril is giving an address on the "International Chemical Union" no further reference will be made to it here. The thanks of the members are certainly due Dr. Baril for the time he has spent on its behalf.

It is thought by the Secretary that in as much as the representation of Canada in the International Chemical Union is a national affair, therefore the Institute is entitled to a grant from the Government to cover its total expenses, and that effort should be made to secure this. At any time we might be faced with the expense of sending a representative across the ocean at our own charges, and in such a case government aid would be almost a necessity.

The books of the Institute have been audited by Mr. Llew. F. Sims, C.G.A., certified auditor and accountant the original of whose report is attached and forms part of this report.

Finance.

Probably the item of most interest to the members in this report will be the amount of Surplus as at July 31st, 1921, at which date all outstanding accounts were paid, and since when no unusual expenses have been incurred, this surplus amounts to \$2,193.98, and out of which \$1,799.-24 is represented by actual cash in the Bank.

In last year's report mention was made of two Donations of Fifty Dollars each, which together with Mr. Charles Robertson's \$500.00 made \$600.00; shortly after this other donations were received from the Montreal district, amounting to \$750.00 made up as follows:

Canada Paint Oil and Varnish Association	\$250.00
Canadian Explosives Limited	250.00

Price Bros. Limited. (Annual Subscription) .... 250.00 thus the total donations secured on behalf of the Institute amount to $1,350.00, one of which is an annual donation of $250.00. These donations were, of course,, duly and appreciatively acknowledged, and it is proposed to write these donors each year telling them of the development of the Institute in which they have shown such an interest.

The Annual Budget of the Institute can be fairly estimated as the following:

Annual Budget.

Annual Income, based on a membership of 200, or 22 more than at present elected.

156 Fellows at $10.00 a year	$1,560.00
22 Associates at $5.00 a year	110.00
22 Additional Fellows at $10.00	220.00
Price Bros. Annual Subscription	250.00
	$2,140.00

Annual Expense, based on 200 members as above.

Rent	$120.00
Stenographic Service	520.00
Journal	400.00
Office Expense, Stamps, etc.	150.00
Travelling in Canada	100.00
Printing (By-Laws Special Reports, etc.)	200.00
Subscription re International Chemical Union (1,000 Frcs.)	100.00
Expenses Annual Meeting (Stenographer $50.00, Official dinner, etc.)	175.00
Balance for contingencies	75.00

It will be seen from the foregoing that with the present fees the Institute can just maintain itself in a manner to allow of its keeping in touch with the broad fields of professional activities and to creditably represent the Chemists of Canada.

In keeping with the general trend of companies in these dull times, the Institute reduced its rent from $30.00 a month to $10.00 and purchased a duplicator at $40.00 with which to send out notices to members, etc. and so save printing, which is such a heavy item. The cost of this duplicator has been covered more than once by the saving already effected. There will always, however, be some things that will have to be or should be, printed. The direct saving in rent, which includes the use of telephone, amounts to $280.00 a year.

It is of course, obvious that increased activity should be shown by increase in membership. If every member were to get one friend to join happy alternatives would present themselves, either further activity for the benefit of the profession, particularly in regard to increased remuneration, both in Government, Universities, and commercial life, or a reduction of the annual fees.

It is submitted that the collection of dues has, considering the particularly hard time, through which we are all passing, been gratifying. 97 per cent. of the membership have paid in full, proving that the present fees are, even in dull times, within the scope of the membership.

Incorporation.

It was felt by the secretary, and I think by the Council, that before any more definite activities should be undertaken the Institute should have secured its legal status by Incorporation.

In this connection the Council have worked steadily during the year, with the result that Incorporation papers were given by the Honorable Secretary of State, to the Canadian Institute of Chemistry, dated August 15th, 1921.

In these incorporation papers are of course, included the By-Laws. These are essentially the very same as those passed at the last Annual Meeting with the necessary additions covering Student membership and Branches, and such verbal changes as were made by our legal advisor to comply with the usual procedure. All changes however were submitted to your Council and have been approved by them before submitting the By-Laws to the Secretary of State. Any changes or additions that the Institute may desire to make cannot become operative until they have been approved by Ottawa.

RECOMMENDATIONS.

Employment Bureau.

This report desires to recommend that the members endeavor to give wider publicity to the Employment Bureau, as a means of service to the profession at large, and more particularly to the employers of chemists. Universities might see that all enquiries were referred to the Bureau even if they at the same time recommend a man for the position who was known to them. Those in executive positions might do the same in regard to the need for chemists in commercial companies. By these means the Institute will become the recognized centre for professional service to the undoubted benefit of the same.

Student Membership.

That members see that proper facility be given in Universities and elsewhere for the acquainting of Students at the commencement of term with the existence of Student Membership. Much good might thus be done for the Student and the Institute. Any information in this connection will, of course, be gladly given by the Secretary.

Membership.

That each member constitute himself a committee of one to secure at least one additional member during the year, and so, either increase the field of usefulness of the Institute, or decrease the fees.

Branches.

That this matter requires the active attention of some interested members in each locality and this winter should not be allowed to pass without the starting of branches in at least the larger centres. Even if only one or two meetings during the season are organized, something will have been gained, in making the Institute a living force in the profession and not merely a Registration Bureau.

Remuneration of Chemists.

That active steps be taken to get information concerning remuneration either exactly as outlined in Mr. Cook's report or at least in the spirit of the same. This means the sympathetic co-operation of every member when he receives the questionnaire. If the Employment Bureau could have a definite minimum scale for chemists based on a report of the Institute as a responsible body of men, it would be of the greatest help in dealing with enquiries. Many companies ask what they should pay for such and such service, and what is needed is a reply based on the average opinion of a body of men qualified to judge.

Legislation.

That it is desirable to continue action, already instituted by the Institute in Ontario, through its Ontario members, with the view to securing in all provinces throughout Canada, such recognition of the Chemical Profession as will place it on a basis similar to Law and Medicine either in whole or in part.

To ensure the real success of the Institute there must be close and enthusiastic co-operation among its mem-

bers and a spirit of Service to the profession which will of itself, redound to the personal benefit of that member by whom such service is rendered.

Adoption.

That this report be adopted particularly as to the estimate of expenses for the ensuing year.

The whole of this report is presented in the best interests of the Canadian Institute of Chemistry, by—

(Signed) HAROLD J. ROAST,
Secretary-Treasurer.

August 29th, 1921. Montreal, P.Q.

Adopted Without Amendment by the Annual Meeting, August 29th, 1921.

Second International Chemical Conference

Report of Canadian Delegate, Dr. Georges Baril, on International Conference of Pure and Applied Chemistry, Brussels.

THE Canadian Institute of Chemistry was extremely fortunate this year in having Dr. Georges Baril, of Montreal University, in attendance at the Second International Conference of Pure and Applied Chemistry, held at Brussels, from June 25th to June 30th. The Institute is greatly indebted to him for the way in which he represented the interests of Canadian chemists. The direct result of his attendance will be closer participation of Canada in international scientific events, and a greater regard abroad for the status of the profession here. An outline is given below of his complete report, which was presented in full to members of the Institute in attendance at the Annual Meeting, in Montreal.

After expressing his thanks to the Institute for the honor of his appointment as their delegate, he expressed the highest appreciation of courtesies extended to him by M. Moreau, President of the International Union and M. Jean Girard, Secretary. Some 82 delegates, representing twenty countries, met in Brussels.

The general Program consisted of a series of meetings and conferences and social activities of a most delightful nature. A number of industrial plants were visited, including the sugar refinery at Tirlemont, and visitors had an opportunity to see, first-hand, some of the destruction caused by German guns and German plundering.

The account of the destruction of the library of Louvain, as given by a professor of the Department of Chemistry, reads like the actions of barbarians thousands of years ago.

After routine business, the following questions were put before the conference:

(1) Organization of the International Commission of Atomic Weights.

(2) Reform of Nomenclature.

(3) Unification of Bibliographical Abbreviations.

(4) Unification of Chemical Abstracts.

(5) Establishment of an International Institute of Chemical Standards.

(6) Establishment of a Thermo-Chemical Unit.

(7) International Table of Constants.

(8) International Food Products Laboratory.

(9) International Patents.

(10) International Laboratory for Ceramic and Combustible Products.

(11) Hygiene of Labor in Chemical Industries.

In his address, Dr. Baril gave a review of the development of the Association from its beginning in 1918, in London, and its first meeting in Rome, in 1920. The new confederation took the place of the old International Association of Chemical Societies. The By-laws of this new union were approved by the International Council for Research, so that it really amounts to the Chemical Section of this larger international union. This was accomplished on July 28, 1921, and chemistry was thereby given an international charter. The general vision would point to the creation of one centre, where all printed chemical knowledge might be gathered, and a museum of standard basic materials established. Already a start has been made on this gigantic program, but there is obviously no limit to the extent to which it may go.

Each of the general headings above were taken up, and plans made for furthering the work. The Canadian Institute will be made aware of the suggestions of suborganizations and will have an opportunity to study the reports of progress, giving suggestions to future delegates; and it would be advisable for the Institute to name a qualified man to direct the work in Canada, allowing him to choose his collaborators.

Dr. Baril pointed out the necessity for the election of delegates and correspondents. Canada must elect two delegates for a period of three years. These men will be our point of contact with the Union, and should keep us in touch with the work that is being done, and it would be their business to promote the work here. These delegates may appoint a proxy to vote for them at meetings, or they may vote by correspondence. Their names will appear on the list of members of Council of the Union.

The general principle being applied is to bring a program of studies before the Council, and then transmit this to interested nations with Council's discussion. A final resolution is not passed until the following year, after all delegates have had a chance to converse with their constituents. The immediate necessity for three correspondents on the International Institute of Chemical Standards was also mentioned.

Dr. Baril closed his address with a stirring appeal for action, both with regard to Canadian and international matters, pointing out in a concrete way some specific things that could be done, if we are to maintain an adequate ideal of the profession of chemistry.

It is well within the program of the Canadian Institute of Chemistry to engage in these efforts of co-ordination and to attempt to consolidate any and all chemical activities in Canada, so that, by the study of our national problems, and the classification of the results of research, we may set out at their full value our resources in materials and men. By such efforts, may this young country of ours be brought to the rank which it will, without doubt, be called upon to play some day in the family of large nations.

CANADIAN INSTITUTE NOTES.

New Committees appointed by the Council of the Canadian Institute of Chemistry for this year, are as follows:

Papers: I. C. Mackie (Chairman); J. S. Bates, E. G. R. Ardagh, T. Thorvaldson, H. W. Matheson.

Legislation: A. Lehmann (Chairman); J. A. Dawson, W. L. Miller, G. Baril, H. E. Bigelow.

Finance: J. W. Bain (Chairman); H. J. Roast, R F. Ruttan.

Remuneration of Chemists: S. J. Cook.

It is proposed by the Institute to hold at least one meeting at such centres as Montreal, Ottawa, Kingston, Toronto, Winnipeg and Vancouver during the winter season, with local members in charge.

OFFICIAL NOTE FROM PRINCE OF WALES TO CANADIAN INSTITUTE.

St. James's Palace, S.W. London,
September 27th, 1921.

Sir:

I am desired by the Prince of Wales to acknowledge your letter of September the 21st. His Royal Highness very much appreciates the greetings which your Institute have sent him, and heartily reciprocates them. He wishes the Institute all prosperity in the future and trusts that it will be successful in its policy of getting into touch with other Institutes of Chemistry throughout the Empire.

Yours faithfully
A. LASCALLES,
Asst. Private Secretary.

H. J. Roast, Esq., F.C.S.

American Institute of Textile Chemists and Colorists.

The American Institute of Textile Chemists and Colorists has recently been established at Boston, where some sixty textile chemists were gathered at an organization meeting.

The objects of the Association are:

1. To promote the technical interest of its members in textile processes.
2. To make practice closer to theory.
3. To develop standard methods of textile and color industries.
4. To encourage textile research.
5. To establish a complete textile chemical laboratory.

Prof. Louis A. Olney, of the Lowell Textile School, was appointed Chairman.

Queens' Branch of the Institute.

Queen's University Branch of the Canadian Institute of Chemistry held their opening meeting for the year on October 25th. The meeting was called for the purpose of organizing for the university term and was most enthusiastic. Dr. Neish gave the students a short talk on the advantages of student membership in the Institute and on the privileges attached thereto. The first technical session of the Branch will be held this week and will be addressed by the Institute Secretary, Mr. Harold J. Roast, who will give an illustrated address on "Metallography." A large enrollment of student members is expected for the Queen's Branch this term.

MEMBERSHIP GROWS STEADILY.

Mr. Bernard Collitt, F.I.C., with Rose and Laflamme, 500 St. Paul St. West, Montreal, has been elected a Fellow of the Canadian Institute of Chemistry.

DEATH OF CHARLES L. WEIL.

The death occurred at his home in Port Huron, Michigan, July 16, 1921, of Charles L. Weil, chemical engineer. The late Mr. Weil was well known to the chemical industries throughout Western Ontario and Michigan. He had made a specialty of evaporation work, and was considered an expert on salt mining and production.

McMASTER UNIVERSITY MAY MOVE TO HAMILTON.

Very fair offers are being set forth by Hamilton interests to induce McMaster University, now at Toronto, to move to that city. It is stated that 70 per cent. of the students attending McMaster come from within a 40-mile radius of that city. The science departments of McMaster might well find good work to do in such a growing industrial centre.

BOOK REVIEWS

"THE ELECTRIC FURNACE."

By J. N. Pring. 482 pages. Longmans, Green & Co. Price $10.50 (American).

This subject has brought forth more than one recent book, and from a Canadian standpoint everything relating to the use of large blocks of electric power is of tremendous importance. The application of electric heat and the rapid advances in the art of electric furnace design have been many and rapid.

In the field where the current acts merely as a heating agent, we have the well-established refractory and carbide industries, and, in short, a whole series of compounds of carbon with metals. In straight chemical processes, electricity has made possible a new steel and ferro-alloy industry, not to mention aluminum and other metals. New degrees of purity have been obtained in copper and zinc production. Conceptions are still changing both in regard to the economics of these industries and the magnitude of industrial operations. The whole subject makes a most important section of chemical industry, and, as such, is well worthy of the comprehensive treatment it receives in such a work as the one under review.

The book contains a very large number of line drawings and plates, which greatly assist in illustrating the theory and practice discussed. If anything might be said with regard to the selection of material, it would be that European affairs are evidently more familiar to the author than developments in America. This is typical of most books, no matter on which side they are published. For example, the chapter on calcium carbide neglects to point out the name of a Canadian company using 50,000 h.p., but is careful to mention small scale European operations.

There is also some doubt as to whether the author knows where Merriton, Ont., is located. The text might well indicate that it was in North Carolina.

Beyond a certain lack of balance in industrial information, nothing but praise can be forthcoming for the general arrangement of the text. Such chapters as the one on the measurement of high temperatures are most excellent. Everything in the field is mentioned, and covered in detail, where developments warrant. For the space occupied, it is doubtful if a better summary of information or selection could be secured without the collaboration of several engineers, each bringing special information not otherwise available.

The book is one of a general series of Monographs on Industrial Chemistry, edited by Mr. Edward Thorpe, and the twenty-five chapters give a good mirror of these industries as the war left them. As a text and reference, the work will be rated highly.

"THE PHYSICAL PROPERTIES OF COLLOIDAL SOLUTIONS."

By E. F. Burton, Second Edition 221 pages, Longmans, Green & Co. Price $4.25 (American).

The first edition of this book is fairly well known both to chemists and physicists. In this second edition chapters concerning the introduction to the subject have been greatly revised, and the material on the "Coagulation of Colloids" re-written and brought up to date. The plan of treatment is fairly comprehensive so that the work is, in reality, a monograph on the literature with very full

references. The physics of the subject is presented in chapters III and IV in good mathematical form. Some of the general topics considered fully are: the ultramicroscope, Brownian movement, measurement of ultramicroscopic particles, optical properties of colloidal solutions, measurements of ultramicroscopic particles and their motions in electric fields, coagulation of colloids, theory of stability colloids.

A short chapter is devoted to industrial applications of studies of colloids. The work has a double interest to Canadians, as Prof. E. F. Burton is well known through his connections with the Department of Physics, of the University of Toronto.

Soil Conditions and Plant Growth.

By Edward J. Russell. 405 pages (Fourth Edition Revised; Longmans, Green & Co. Price $5.00 (American).

The development of scientific data and the results of research in many fields has expanded the literature on this general subject. The author in this revision expands previous treatment, but maintains the main highway of progress.

A series of monographs, to be known as the Rothamsted Monographs on Agricultural Science, will appear, covering the fields of soil physics, protozoa, bacteria, fungi and algae, and chemical changes. Thus the complete set will have developed from an original, small volume in 1912.

Aside from soil conditions, one chapter is devoted to the historical development of the subject and one to the interpretation of soil analysis. Specific chapters relate to soil composition, colloidal properties, carbon and nitrogen cycles, biological conditions, and the relation of micro-organic organisms to soil and plant growth.

A selected bibliography of papers, lists some 323 articles, covering practically all original works published on these related subjects.

For agricultural college students and those in whose hands investigations are placed, such a reference will be found of great merit.

"Modern Chemistry, Pure and Applied."

By Arthur J. Hale. Vol. 1 and Vol. 2. Virtue and Co., London. Price, $4.50 per volume.

These two volumes appear to be the first of a new set of books in the semi-dictionary class. It is proposed to treat all branches of chemistry, following plans which are partly those adopted in such works as Thorpe and partly those of the standard descriptive texts on industrial and theoretical chemistry.

Vol. 1 contains seven chapters, covering air, water, atomic theory, sulphur, chlorine, nitrogen group, carbon, silicon and boron. With these headings, the allied elements and compounds are discussed, and a very considerable stress placed on latest methods of commercial production and industrial application. The aim seems to be to join the purely scientific and the applied in a larger measure.

Vol. 2 covers alkali, metals, solutions, alkaline earths, considerations of chemical changes, equilibrium, the aluminum group, rare earths, inert gases and radio-activity. Such a combination does not at first sight appear to be very coherent and undoubtedly the author has broken new ground in his method of presentation. After reading a few chapters, this novel method appears to have considerable to recommend it. Undoubtedly even the best books on theoretical chemistry now used as texts do not convince a student that he is dealing with a science that has many real applications. When, however, you place illustrations of page size beside reading matter dealing with practical, very recent, large scale methods, relating this to the usual theory and stock presentations of fundamental laws and facts about compounds, the whole effect is rather stimulating.

We would venture to state that this method is ideal for technical school students and those going in for chemical engineering. We do not know of any other effort along this line, and certainly the publishers are making it possible for the average chemist or student to possess in one set a very complete treatise on chemistry, at a reasonable cost.

We rather believe that the ideas of the author will be supported and that the work will be accepted as filling a vacant place in the requirements of a large number of professional chemists and teachers.

"Metallurgy of Common Metals."

By Leonard S. Austin; 615 pages. John Wiley & Sons. Price, $7.00 (American).

This is a fifth edition, covering the latest methods employed in the mining of gold, silver, iron, steel, copper, lead and zinc, as well as general information on fuels, refractories, ore preparation, crushing, etc. Considerable space is devoted to plant equipment, costs and the business end of metallurgy.

Throughout the book, processes are illustrated with plates of standard machines, and such important matters as refractories, crushing, roasting and fuels are treated in detail, as a text and reference the work may well be recommended.

Although many changes have been made since the fourth edition of 1912, the remarkable progress in magnitude at least of some of these industries is illustrated by the descriptions of certain mines. The Hollinger Mine is quoted as treating some 500 tons daily. Even in the period of publication, this has grown about six times, with large additions to the plant. The metals covered are treated most completely, and it might be suggested that in further editions the list be extended to include, for example, nickel and cobalt. As the book has such a direct bearing on the metallurgical industries of Canada, it should be well received by Canadian metallurgists.

COMMERCE COURSES FOR GRADUATE ENGINEERS.

Queen's University this year outlines a post-graduate course of studies for all graduates of Canadian universities, and others with academic or practical engineering experience. The movement is to be recommended as instruction in Business Management, Economics, Finance, Marketing and Organization work, is very essential if engineers are to fill executive positions properly. A very fine list of special lecturers has been secured, including E. W. Beatty, President of the C.P.R., and prominent business and industrial leaders from Canada and the United States.

Mr. Victor van der Linde of the van der Linde Rubber Company, Toronto, has returned home after a two months business trip to England. Mr. van der Linde reports the chemical and allied industries in England to be recovering even better than was expected from the effects of the coal strike and general business troubles.

Chemistry and Science in the Baking Industry

Recent Toronto Convention, October 3rd-8th.

THE Convention and World's Fair of Bread and Cake Manufacturers' Association held at Toronto, October 3rd to 8th, was certainly the largest thing of its kind ever attempted in Canada. The machinery exhibit was in the Transportation Building and the convention in the Dairy Building of the National Exposition. Early in the week visits were paid to prominent plants in Toronto, including Canada Bread Company's new plant, and those of the Ideal Bread Company and Harry Webb Company.

On Tuesday addresses were given covering the technical and business end of the industry. Mr. James Acton, of Acton Publishing Co., spoke on the spirit of co-operation in business; W. D. Blair, of White Plains, N.Y., on Modern Baking Machinery. Prof. Wm. Jago, of Hove, Sussex, England, delivered a series of very important addresses during the convention on the "Biology of Fermentation and Science in Bread Baking." Sir Henry Drayton had something to say in support of the "Sales Tax." B. A. Gould, of Canadian Milk Products, spoke on "Selling Forces." Dr. R. E. Lee, of the Fleischmann Company, outlined why bakers should aim for "a quality loaf," and Prof. J. Wihlfahrt, of the same company, spoke on "Modern Methods of Shop Control." Prof. R. Harcourt, of Guelph, described the "Baking qualities of flour from new wheat," while E. C. Brown discussed "Better Cakes." Mr. O. Cardinal, of Montreal, spoke in French on the importance to the baker of a better loaf.

The one outstanding thing that is demonstrated by such an exhibition is the way chemistry, physics, bacteriology, and several branches of engineering are being applied to the growing of cereals, their transportation and storage, milling, baking and the production of accessory materials, such as yeast, yeast foods, milk and malt extracts, sugars and fats.

Many agencies are helping the baker, both governmental and otherwise. Those who supply him are giving him products prepared with the greatest care, and the one thing the industry needs would seem to be the better application in the small plant of the knowledge already available. That this is coming was indicated by the spirit of the convention. The machinery that makes for efficiency has already arrived. Visitors could see bread made by automatic equipment, and the displays of machinery were indeed most complete, running over $1,000,000. Among the exhibitors whose products enter into the business in various non-mechanical ways, were the Fleishmann Company, producers of animal fats; malted products of which Canada has a growing company in Canadian Malt Products, Ltd.; the evaported milk industries and producers of essences. One new company in this last group is G. F. Sterne and Sons, Brantford, who are now agents for H. Boake Roberts and Co., Ltd.

To see such a complete cycle of industries all under the strictest scientific control, and to compare this situation with that which existed but a few years ago, prompts the idea that the near future will see the chemist employed in larger plants where he can carry through to completion the work begun by those who supply the baker with his products.

The words of Dr. E. H. Barnard, Director of the American School of Baking, Minneapolis, are strikingly true, when he said: "Bread is a chemical compound, made from chemical ingredients, by chemical processes. The baker is a chemist; his shop is a laboratory. The smelting of ore into iron, the fusing of lime, sand and soda into glass, the conversion of salt into soda ash, the production of dyes from coal tar, is no more subtle a chemical change than the manufacture of an ideal loaf from the starch and gluten of a grain of wheat through the amazing influence of the growing yeast plant. Diastatic and proteolytic enzymes, phosphate and calcium content, gluten and protein values, hydrogen ion concentration, lactic and butyric fermentation, are terms which are now common phrases in the bakery. Old and young doughs, weak or strong flours, high or low glutens, all these imperfect expressions of flour strength and dough character are passing out of the vocabulary of the baker.

And with the passing of the craft and the development of a scientifically controlled and operated industry, the old baker, the last of the trio, "the butcher, the baker, the candle stick maker," has passed away. The candle stick maker put away his moulds when gas and electricity came to illuminate the darkness of the night. The butcher has been supplanted by the great packing industry which gathers its raw materials from the pastures of a continent and distributes without waste the finished product to all the world. The baker has left his basement shop, his wooden troughs, his hard hand labor. He is a manufacturer. From the time the sack of flour is delivered at his door until the bread leaves the shop, every process is mechanical. The human hand has been supplanted by power-driven machines.

And with the development of the modern bakery has come, as in every other industry, the need for exact facts. It is not enough to know that a certain flour is weak, or that loaves come from the oven with poor color, undersized or badly formed. The baker must know why a flour is weak and how to blend and treat it. Why his bread is not attractice in appearance and how he may remedy it; why it lacks flavor and food value, and how to improve it."

If indeed the time should come shortly when chemists are given a measure of control of baking operations, it will be a good opportunity for them, and the baking industries will greatly benefit. The time does seem ripe for the expansion of the profession in this direction.

Two New Motor Industries for Toronto.

As announced in the press, the Durant Motor Car Co. of Detroit have purchased the munition plant at Leaside, Toronto, and will establish a fully equipped plant there for the manufacture of motor cars. Mr. Durant was formerly president of the General Motors Company, and the enterprise at Leaside is looked on as one of the best additions to Canada's industry in some time. Another American company to follow suit is the Gary Motor Truck Company of Gary, Indianna, who announced recently their intention of establishing a Canadian branch at Toronto, where they have purchased the property and all the assets of the Chase Tractor Corporation for about $1,400,000. The Gary Company will manufacture a full line of worm-drive motor trucks and Chase Tractors.

Completion of the new cold storage plant now in course of erection at Montreal by the Harbor Commissioners will be effected before the beginning of winter and the building will commence to be used some time this fall, according to an official announcement. The total cost of the new plant is estimated to be $2,200,000, and its capacity for dry and cold storage will be over half a million cubic feet.

Canada as a Market for British Chemical Products.

That there is some evidence of an awakening on the part of British firms to opportunities on the Canadian market, is made clear by an editorial review in the August 15th issue of the Journal of the Society of Chemical Industry. England needs export business and Canada needs a cheaper source of machinery and chemicals not made here or likely to be made for some time. Why should Canada remain bound to the dearest sources of foreign supply unless the product has very peculiar merits? Great Britain has, we believe, always found more difficulty in selling in Canada than on other Empire markets. This seems at least true in the chemical industries and in special machinery lines. Connections would be made more readily and extended if British firms carried on the following program:

1. Make a study of market and selling conditions, using a qualified chemical engineer or chemist salesman.
2. Appoint people as agents who know Canada and Canadian chemical and allied industries, and are chiefly concerned with this line of business. Such agents can be secured.
3. Where a company cannot support a man or office in their interest alone, they should co-operate with some other English exporter in the establishment of a co-operative arrangement. This is particularly true in machinery and equipment field.
4. Carry stock and equipment within the Dominion.
5. Render a continuous service before and after sales.
6. Carry on a reasonable amount of publicity and advertising in Canadian papers following the types observed in the best American and Canadian publications and trade papers (the distances are great and the field scattered, therefore this method is more economical than usual).

The review as given in the above Journal is well worth repeating, here, as it is one of the best conceptions of the situation originating from England which has yet been issued.

"The stimulus of the late war did much to advance the chemical industries of Canada, whose development has been, and will be, greatly facilitated by the possession of a rich variety of raw materials and cheap hydro-electric power. According to the Census of Industry for the year 1918, the total domestic output of chemicals and drugs was valued at $38,252,587, the capitalization of the manufacturing firms was $26,029,530, and the wages or salaries paid to 4,292 employees amounted to $5,872,947. Nevertheless, the Dominion has continued to import large quantities of chemicals and allied products. In 1918-19 the total import trade was valued at $34,282,647 (much of which was in respect of war purchases); in 1919-20, the first "peace" year, the value dropped to $29,886,102; but last year it rose to $36,334,612.

Although the share of the United Kingdom in the Canadian chemical market has been gradually rising during the past three years (from $3,397,095 in 1918-19 to $4,154,345 in 1919-20, and to $6,037,185 in 1920-21), the bulk of the trade is still held by the United States; imports of American-made chemical products, which amounted to $28,719,765 in 1918-19, reached only $23,854,300 twelve months later, but rose last year to $26,787,896. In 1920-21 "other countries" secured sales amounting to only $3,509,531, as compared with $1,877,457 in 1919-20 and $2,165,787 in 1918-19. Thus it is clear that in a market worth about £9,000,000 at current rates of exchange, British goods have mainly to compete with those from the United States which are sold under advantageous geographical conditions, but under the disadvantage of higher rates of duty and with an exchange situation unfavourable to American exporters.

This exchange situation will demand very careful attention during the next few months as, owing to the effective embargo placed by the new American Emergency Tariff upon imports of Canadian agricultural products into the United States, an export trade recently worth about $160,000,000 per annum will be diverted from the United States to other markets, including the United Kingdom. A powerful support to the Canada-America exchange is thus removed, and it is very doubtful whether the present level of 12 to 15 per cent. from parity will be maintained when the expected general revival of purchasing gathers momentum after the harvest.

The decision of the Canadian Customs authorities to value American goods for duty, not as hitherto on the face-value stated on the invoice, but on that value (in American dollars) augmented by the exchange margin on the date of shipment, adds forthwith an additional burden of 15 per cent. to the amount payable in duties, but imports from the United Kingdom are valued for duty on a basis conceding the importer the full benefit of the depreciation of British currency. For instance, British goods valued at £100 on a day when the rate of exchange is $4=£1 are assessed, not on their face-value, but on £100×4÷4·866, or £82 3s. 10d., whereas American goods valued at $100 and shipped on a day when the exchange margin reached 15 per cent. would incur duties at General Tariff rates assessed on $115 instead of on their face-value. Should these exchange rates fluctuate to the extent anticipated, the measure of advantage to the British competitor will be all the more apparent, and the conditions outlined should induce those firms which have hitherto not been interested in the Canadian market to examine the situation and get into touch with Canadian importers who are now purchasing mainly from the United States.

Details of the Canadian import trade in chemical products during the fiscal year ended March 31 last are as follows:

	Total Imports	Imports from U.K.	Imports from U.S.A.
	$	$	$
Acids of every kind	892,197	404,358	459,690
Drugs, medicinal and pharmaceutical preparations.	3,457,913	1,307,077	1,679,047
Dyeing and tanning materials	6,031,566	818,241	4,447,808
Aniline dyes	2,997,689	555,332	2,267,112
Logwood, etc., extract	1,890,940	1,658,814	1,244,013
Explosives	750,385	296,040	430,178
Cellulose products	1,420,374	41,725	1,370,429
Fertilizers................	4,272,054	172,056	3,347,793
Paints, pigments and varnishes	4,251,620	509,128	3,513,581
Soaps	1,424,446	103,883	1,244,677
Perfumery, cosmetics, etc.	1,202,585	94,487	470,763
Inorganic chemicals, not otherwise provided for..	7,400,430	858,222	6,280,060
Other chemicals and allied products	5,231,042	1,431,968	3,543,870
	36,334,612	6,037,185	26,787,896

OVERSEAS AND FOREIGN INDUSTRIAL NEWS

Special Correspondence to Canadian Chemistry and Metallurgy. By Our London Representative.

Imports into the United Kingdom during the eight months ended August 31st of chemicals, drugs, dyes and colors were worth only £9,000,700, as compared with £22,840,087 for the corresponding period last year, and £8,679,408 in 1913 (first eight months). Exports reached £13,276,231, as compared with £26,648,200 and £13,544,033 respectively. The huge drop from last year's figures is, of course, to be attributed to the coal strike, the trade slump and to low prices. The improved demand for general chemicals continues, but the quantities are still limited and below the normal. The improvement is noticeable chiefly in the home trade, though the demand for shipment is better than it has been for some time. Business is very difficult in the chemical market and it is almost impossible to give prices, as in view of the very limited consumption of a number of chemicals there is at the present time undoubted over-production. Oftentimes sales are made at prices which have no bearing or relation to the actual manufacturing cost of the product in question.

British Iron and Steel Production.

Statistics issued by the National Federation of Iron and Steel Manufacturers show that the production of pig-iron in August amounted to 93,600 tons, compared with 10,200 tons in July. The output in March, the month immediately preceding the coal stoppage, was 386,000 tons, and in August of last year 752,000 tons, which was the record monthly total since the war. The production of steel ingots and castings in August amounted to 432,600 tons, compared with 117,200 tons in March, and 709,200 tons in August, 1920.

The number of blast furnaces in operation at the end of August was 46, as against 15 at the end of July. The number in operation immediately before the coal stoppage was 109, and in August of last year 303.

Of the pig-iron produced in August 30,200 tons were hematite, 24,400 tons basic, 28,500 tons foundry, 8,500 tons forge, and 2,000 tons of "other qualities."

The further decline in pig-iron and steel prices which took place in September in the Midland market means, it is hoped, a continuance of the improvement in production shown by these industries for August. It has been the complaint of these trades that in the matter of competition with foreign makers they were handicapped because the price of coke was too high, and they must have it shillings a ton cheaper before their furnaces could be run on a competitive basis.

Belgian Steel Trade Recovering.

The recovery in the Belgian iron and steel trade becomes more marked. The contract for 600 20-ton trucks for Sofia has now been definitely placed with Belgian manufacturers, who have also succeeded in booking orders for 42,000 tons of rails for the Belgian Government, 13,000 tons of rails for Chile, and large quantities of material for the Belgian Congo, China, and Spain.

Swedish Iron Industry.

A report on the situation of the Swedish iron industry, which was read at a meeting of the Ironworks Association at Gothenburg, shows that the export of iron ore during the first seven months of 1921 amounted to 2,560,000 tons, or 660,000 more than during the same period of 1920. The export of different kinds of iron during the same period of 1921 totalled 68,000 tons, as compared with 162,000 tons during the first seven months of 1920. Statistics regarding the activity of furnaces and forges are very depressing. For example, only 20 smelting furnaces out of a total of 134 were working at the end of July, as compared with 66 at work at the end of July, 1920. The steelworks have only been producing spasmodically. Foreign competition, owing to the exchange rates, has caused a very difficult situation in the industry.

Safeguarding of Industries Act.

On October 1st, 1921, the "Safeguarding of Industries Act" came into operation in Great Britain. The Act calls for a duty of 33 1-3 per cent. ad valorem on quite a lengthy list of articles, but does not apply to goods grown, produced, or manufactured within the British Empire, or within those various countries included in the Favored Nations Treaty, viz.:—United States, Italy, Japan, Denmark, Norway, Sweden, Spain, Venezuela, Argentina, Greece, Belgium, Netherlands, Portugal, Bolivia, Columbia, Costa Rica, Esthonia, Honduras, Liberia, Mexico, Nicaragua, Paraguay, Persia, Rumania, Serb-Croat-Slovene State and Switzerland. Included in the list of dutiable goods under this Act are: optical glass and instruments, scientific glassware, laboratory porcelain, measuring instruments; compounds (not including ores or minerals) of thorium, cerium, and other rare earth metals; synthetic organic chemicals (other than synthetic organic dyestuffs, colors, imported for use as such, and organic intermediate products imported for their manufacture); analytical reagents, all other fine chemicals (except sulphate of quinine of vegetable origin) and chemicals manufactured by fermentation processes; arc lamp carbons; metallic tungsten, ferro tungsten, and manufactured products of metallic tungsten.

Provision is made in the Act for any article in the list to be challenged by persons who object to its inclusion, and it is probable that there may be quite a few protests against the inclusion within the class of fine chemicals, of chemicals which are regarded in the trade as merely "industrial."

New Factor in European Steel Trade.

The new works of the Societie Normande de Metalurgie at Caen (Normandy), recently visited by members of the Iron and Steel Institute of Great Britain, are destined to play an important part in the international markets in the coming years. There is an abundance of ore available for export to Great Britain as return cargoes for the coal required for the exploitation of the mines, and the ironworks themselves, which were designed before the war by the German Thyssen interests, comprise two large blast furnaces of a daily capacity of 350 to 400 tons, one of which is in blast already. There are extensive coke ovens with a large by-product recovery plant, and the installation of a slag cement works is contemplated. The steel works comprise Hilger and Kerpley producers and five 30-ton basic open-hearth furnaces, besides the Bessemer converter department with three 30-ton Bessemer converters. The rolling-mills are all electrically-driven, the electric power station being capable of producing 54,000 H.P. Another interesting feature of the district is a new and well-equipped shipyard, where very extensive developments are contemplated.

Swiss Aluminium Exports.

The Swiss Aluminium Company, which chiefly supplies Germany, Austria and the other Succession States of Central Europe, exported in the first six months of 1921

3,253 tons of pure aluminium—100 tons less than in the corresponding months of 1913.

The complete recovery of Swiss aluminium exports to the countries with depreciated currencies clearly proves that prices within Germany are quickly reaching the level of the world's markets.

It is understood that the intention of France to replace the small notes of 50c. and 1f. issued by local chambers of commerce by new coin of an aluminium-copper alloy will occupy the French aluminium works, the most important competitors of the Swiss, for many months.

French Exploiting Moroccan Phosphates.

Early in September the third consignment of 500 tons of Moroccan phosphates reached Marseille from Casablanca, and arrangements have been made for weekly shipments of from 400 to 500 tons from the Oued-Zem beds. The Mines Department, meanwhile, is actively pursuing its investigations of the deposits. According to calculations, normal exploitation is due to begin in 1926, when it is expected that production will reach about 500,000 tons per annum, to be raised to 1,750,000 tons in 1930 and 3,000,000 tons in 1940.

The Belgian Glass Industry.

The Belgian glass industry is in a sorry condition. The Union of Belgian Glassworkers refused to hear of a cut in wages, and the slump reigns supreme. Several factories are now adopting a mechanical process whereby the work can be done with fewer hands. Numerous ex-glassworkers in the Charleroi district are now invading other industries. -

Germany's Industrial Alcohol Shortage.

The state of trade and industry is chaotic, and the new alcohol regime, which was enforced on June 10 last, has made matters even worse. Germany no longer holds the alcohol monopoly. As a consequence, the Rhenish provinces are forced to cover their needs in pure alcohol abroad (in no case in Germany), while they are compelled to distill their own industrial alcohol.

Pure alcohol was previously sold at a very high figure, and, by a kind of see-saw arrangement, the price of alcohol for industrial purposes was lowered in proportion to the profits reaped from the sale of pure alcohol. Now, however, the shortage of industrial alcohol has become acute, especially since the Inter-Allied Commission decreed the confiscation of all the stocks in the stores of the monopoly administration.

The large chemical industries and all others using alcohol are much affected by the shortage. The export trade in chemicals is very slack; though the industry still exports to Great Britain, prices are low, and the trade is seriously hindered by Chinese duties and dumping regulations.

The scarcity of alcohol has also had an unfortunate effect upon the perfume and pharmaceutical industries, as well as upon the tinned fruit industry, where short time is now the rule.

Industrial Alcohol Industry Proposed for Jamaica.

A proposal to undertake the conversion of rum into alcohol for industrial purposes in Jamaica has been referred to a committee of planters, and the head of the Department of Agriculture is to assist in the enterprise. It is proposed to import plant for the purpose which will be installed in the outskirts of Kingston. The first consignment of rum to be so treated would comprise 800,000 gallons. This would be converted into rectified spirits to be shipped to Canada and elsewhere. No attempt will be made to produce alcohol for use in motor vehicles, as this would not be a remunerative industry. A continuous still is to be installed at a 10,000-ton sugar factory which is being erected on the north side of the island for the manufacture of alcohol for commercial purposes.

Sulphuric Acid from Gypsum.

During the war, when Germany experienced great difficulties in importing iron pyrites, at least one large plant was erected and operated for the manufacture of sulphuric acid from gypsum. While this method may not always have a practical application in times of peace, the Badische Company, whose Oppau plant has recently been destroyed, had developed a method of making ammonium sulphate for fertilizer purposes, using gypsum instead of sulphuric acid. Sulphate of ammonia can, therefore, be made to any extent required without the necessity of importing materials at the ruinous prices resulting from the exchange situation.

New Japanese Steel Process.

A new process by which sand-iron, or magnetic sand, may be converted into pig-iron and thence into steel, has just been made public by Mr. Gore Matsukata and Dr. Asobu Naito.

The sand-iron is combined with coke, hot gas flames being used and ferro coke being formed, from which iron can easily be taken. Japan has little or no iron in any form which may be easily mined, but magnetic sand is abundant throughout the empire.

THE ELECTRICAL APPARATUS AND MACHINERY INDUSTRY IN CANADA.

The manufacture of electrical apparatus and machinery in Canada constitutes one of the most important industries in Canada, the total capital invested in the industry in 1919 being $45,956,399, with 95 plants in operation of which 64 were in Ontario and 16 in Quebec. A report of the industry by the Dominion Bureau of Statistics shows that the total cost of materials used by the industry in 1919 was $15,257,617, and included copper (bars, sheets and wires) 19,317,314 lbs. valued at $4,822,576; foundry castings, iron, 8,424 tons valued at $1,153,,484; foundry castings, brass and copper, 1,694,439 lbs. valued at $498,776; steel bars and sheets 2,808 tons valued at $679,715; aluminum (bars, sheet and wire) 31,142 lbs. valued at $23,244; sulphuric and other acids $21,247; ammonium chloride $99,881; mica. $100,393; glass and porcelain, $136,912; carbon for electrodes, $106,057; magnesium (bars, sheet and wires (a15,000; paints and varnishes, $81,p93; chemicals (other than those referred to), $79,809.

The total value of the products of the industry, as at the work, for 1919, was $34,187,658 and included dynamos and generators, $1,804,687; transformers, $1,502,261; switchboards, $1,011,387; motors, $1,692,823; storage batteries, $561,974; primary batteries, $1,767,094; carbons, $1,243,631; incandescent lights, $2,424,720; insulated wires and cables, $8,536,126; electric stoves and heaters, $1,009,353; telephone apparatus, $1,835,979.

THE GLUE INDUSTRY IN CANADA.

Reports of the Dominion Bureau of Statistics covering the glue industry in Canada show that in 1918 there were eleven plants making glue and mucilage. The total production for the year was valued at $1,465,163 which included fish glue and other glues having a selling value at the factory of $897,353; wet paste and other adhesives worth $23,145; and other products and by-products such as grease, fertilizer, neatsfoot oil, etc., to a total value of $544,665. The importance of the glue industry to the

chemical trade may be learned when it is stated that in the year 1918 the industry used chemicals to the value of $31,485. The firms reporting did not specify the chemicals used, but the Bureau hope that in future reports more detailed information will be available. Some of the products manufactured by the industry together with their selling value at the works were as follows: Fish glue, $182,982; other glue, $715,271; grease, $319,159; fertilizer, $93,209; dextrine, $17,459; size, $16,114; gum, $8,176; neatsfoot oil, $7,537; wet paste and other adhesives, $23,145.

MINERAL PRODUCTION, ONTARIO, FIRST SIX MONTHS, 1921.

With the exceptions of lead and gold, a marked decline is noted in Ontario's mineral output for the first six months of 1921 as compared with the corresponding period in 1920. The mining industry has experienced the same depression felt in many other industries. The gold production promises a greater yield for the full year than any previous record, and considering the shortage of electric power in the northern districts during the first part of the year together with the slump in the price of silver, the output of silver in Ontario is creditable. The production figures for some of the principal minerals as given in the report covering the period mentioned are as follows:

	QUANTITY		VALUE	
PRODUCT	1920	1921	1920	1921
Gold, Ounces	277,656	286,018	$5,690,504	$5,761,504
Silver, Ounces	4,474,322	4,277,762	5,077,028	2,552,125
Platinum metal, ounces	184	941	12,443	26,317
Copper, Sulphate, lbs.	89,935	87,382	4,497	3,495
Copper, Metallic, lbs.	2,918,153	2,297,732	470,949	272,132
Copper, in mattet tons	4,434	344	1,241,520	55,040
Nickel, metallic, lbs.	4,854,979	21,773	1,696,687	1,479
Cobalt, metallic, lbs.	113,239	30,423	266,045	91,355
Lead, pig, lbs.	749,820	1,504,830	71,006	79,322

EXPLOSIVE INDUSTRY, CANADA, 1918.

Eleven firms manufactured explosives in Canada in 1918. This was the last year of the war and Canada was producing explosives on a scale far in excess of anything previously attempted. The total capital invested in the industry was $19,172,539. Over 4,700 workmen were employed. The industry used $1,047,175 worth of fuel of which $70,416 was for fuel oil. The total value of all the products of the industry was $41,477,828, being the selling value at works. The cost of all the principal materials used during the year was $23,125,839 including nitrate of soda $3,188,878; mixed acids, $2,276,195; sulphric acid, $1,200,697; nitric acid, $1,519,014; wood alcohol, $2,738,791; oleum, $1,009,294; toluol, $1,035,971; linters, $1,626,358; grain alcohol, $725,713.

RECENT DECISIONS OF CANADIAN CUSTOMS BOARD.

The following decision, effective 1st October, 1921, declared that when raw material owned by a person or firm is delivered to another person or firm for manufacture or teatment, sales tax is applicable on charge made for such manufacture or treatment. It is ascertained that binnacles, thermometers, mercurial barometers and aneroids for ships' equipment are no longer made in Canada, and these articles may therefore be admitted under tariff item 470 when imported for the equipment of ships or vessels. (In effect 1st July, 1921.) Declared that 75 H. P. Diesel Engines are considered to be of a class made in Canada and not entitled to entry under tariff item 470. This does not include Semi-Diesel Engines, which, until otherwise determined, may continue to be admitted under tariff item 470, as of a class or kind not made in Canada.

Mining and Metallurgy in British Columbia

(Special Correspondence to Canadian Chemistry and Metallurgy.)

ORE receipts at the Consolidated Mining and Smelting Company's smelter, at Trail, for the first nine months of the present year, have beaten all previous records, 307,493 tons having been received, against 251,735 tons for the similar period of last year, and 258,323 tons for the first nine months of 1919. Close to 98 per cent. of the ore has come from the company's own mines, little custom ore having been treated. The achievement is particularly noteworthy on account of the low prices that have ruled for silver, lead, copper and zinc throughout the present year. According to the Dominion Bureau of Statistics, the Canadian lead output for the first six months of the present year was 90 per cent. of that of the whole of last year, while the zinc output for the first six months of this year was 70 per cent. of last year's output. With the exception of about two and a quarter million pounds of lead, the whole of the lead and zinc output of the Dominion for the first six months of the present year came from British Columbia, and nearly the whole of it from the Trail smelter. At the commencement of last month the company came into the market once again, for the purchase of silver-lead and copper ores, and at the same time curtailed the output of the Sullivan mine, which has provided the company with lead-zinc ore for some time. The Sullivan mine ore averages about 18 per cent. of zinc and 12 per cent. of lead, and by blending this with custom lead ore, it will be possible to increase the lead output without increasing the zinc. It is understood that the company has a much larger stock of zinc than of lead on hand. By pluckily increasing its base-metal output in the face of the depressed metal market, the company has done much to relieve the unemployment situation in the Province, and has earned the thanks of the community. The Consolidated and the Granby, which, also, has maintained its output, employ at their mines and smelters in the neighborhood of 3 000 men, and indirectly gives employment to fully as many more.

Van Roi Returns to London Owners.

Clarence Cunningham, the Slocan mine operator, has relinquished his option on the Van Roi mine, at Silverton. Mr. Cunningham obtained an option on the mine in 1916 for $225,000, and two years later paid a substantial instalment. By agreement with the owner since then, payments have been made out on royalties on ore-shipments. Under Mr. Cunningham's control some $350,000 worth of ore has been taken from the mine, and it is understood that the owning company has benefited to the extent of about $150,000. The Van Roi and the Le Roi No. 2, at Rossland, are believed to be the only two London-controlled mines still in existence out of the large group of mines that was purchased by English capital in the boom days, the other mines having passed to other owners. Since the erection of its flotation plant, the Le Roi No. 2 seems to be taking a new lease of life, and it is, therefore, likely that the London owners will operate the Van Roi themselves.

Ivanhoe Mill Nearly Completed

The Silversmith Mines, Ltd., has nearly completed the reconstruction of the Ivanhoe mill, which it purchased for $15,000 from the Minnesota Silver Co. early in the summer. The renovated mill, which is entirely a gravity one, will have a capacity of 150 tons daily. The plant will be put

into operation early in November. An aerial tramway connecting the mine with the mill, a distance of 4,500 feet, also is nearly finished. A splendid body of high-grade milling-ore has been developed, which, it is estimated, will keep the mill in operation for several years.

The Taylor Mining Company has re-opened the Dolly Varden mine in the Alice Arm district. The railway connecting the mine with Alice Arm, a distance of 18 miles, is also being re-opened. Though work will be confined mainly to development, it is expected that some 4,000 tons of ore will be shipped before the winter snow closes the railway again. Arrangements have been made to continue development during the winter. A compressor is being moved from the Dolly Varden to the Wolf. All machinery at both mines will be operated by the hydro-electric plant, which was constructed last year.

Interesting Mining Case

The action of the Engineer Mining Company, the original owners of the Engineer mine, at Atlin, which is generally supposed to be the richest gold mine in the Province, against the estate of the late Captain James Alexander, has been dismissed, the judge ruling that action in the matter had been delayed too long. The plaintiff claimed that Alexander jumped the claim, made false affidavits when applying for the title, and that he arranged that judgment be brought against the company in the courts at Atlin. Captain Alexander worked the property for a number of years and took a considerable amount of gold from it by the crudest appliances. He interested the Mining Corporation of Canada in the property, and engineers were sent to make an examination. While returning from this examination in the ill-fated Princess Sophia, Captain Alexander, his wife, and the engineers lost their lives, and since then the property has been continually in the courts. Notice of appeal from the present decision has been given.

Granby Co. May Add Lead and Zinc Furnaces.

The Granby Consolidated Mining Smelting and Power Compan's engineers have examined a number of properties recently in Alaska and Yukon, as well as in this province. Among those examined is the Silver-Standard, at Hazelton, and, as this is a silver-lead-zinc property, it would seem to point to the Granby company anticipating the addition of lead and zinc furnaces to its smelting plant at Anyox. This would meet with approval from independent mine owners on the coast of British Columbia, and also owners of silver-lead mines at Keno Hill, in Yukon territory. At the present time ore from Keno Hill has to be shipped to the Selby smelter, on San Francisco Bay, and the owners of properties are grumbling at the excessive cost of freighting their ores. Everything points to Keno Hill becoming a big producer of silver-lead ore, as some of the largest United States interests, including the Guggenheims and the Bunker Hill and Sullivan, own and operate claims there. All things considered, it is not at all unlikely that the Granby will add a lead-smelting department, and possibly a zinc plant, too, to its present equipment.

Mining Notes.

The Consolidated Mining and Smelting Company is maintaining its output of lead and zinc, and considerably increasing its output of gold, the last being produced from ore from the company's Rossland mines.

The new concentrating plant at the Le Roi No. 2, or Josie, mine, was put into operation recently, and is said to be giving satisfaction. The Le Roi No. 2 company has some extensive dumps of ore that is too low grade to ship profitably, and the new plant is operating on this material, out of which, it is claimed, enough money can be made to pay for the concentrator.

There is a slight revival of mining in the Slocan, but things generally in the province are still dull. The new concentrating plant at the Ottawa mine has been put into operation, and options have been given on a number of mines in different parts of the province.

The first 100-ton unit of the new concentrating-cyanide plant at the Premier mine has been put into operation, and is stated to be giving complete success. Work is progressing well on the aerial tramway, which will be the longest of its kind in the province, having a length of 11½ miles. H. A. Guess, vice-president of the American Smelting and Refining Company and president of the Premier Gold Mining Company, is paying a visit to the mine at the time of writing.

BRITISH COLUMBIA INDUSTRIAL NOTES.

The Pacific Coast Color Manufacturing Company has been organized in Vancouver for the purpose of manufacturiny pigments from native ores. The company claims to have the rights of a German process that hitherto has not been used in this country, and its chemists have developed a large number of pigments from native ores, principally those of lead, zinc and iron. The necessary machinery has been ordered, and a plant is being erected on Industrial Island, Vancouver. Besides pigments, the company proposes to put up oil paints, shingle stains and like products ready for use.

Yarrows, Ltd., ship builders of Victoria, has added the manufacture of water pipes and fittings to its already rather versatile plant.

Progress Shown by Large Pulp and Paper Company.

The Whalen Pulp & Paper Mills, Ltd., has recently issued its annual report for the fiscal year ended February 28. The financial statement shows the gross operating profits of the company to have been $1,312,576.22, and the general administration expenses to have been $203,721.60. The sum of $678,251.05 is deducted for bank interest, fixed charges, and depreciation of plants, leaving a profit for the year, after writing down log inventories to their approximate market value and before providing for the depreciation of capital assets, of $530,603.57. First mortgage and refunding gold bonds to the amount of $100,000 and gold notes to the amount of $100,000 were retired during the year, while the fund provisions for retiring gold notes was increased by the amount of $88,354.47. During the year $858,735.61 was spent on capital improvements, being chiefly the work commenced in the previous year and improvement to the power plant at the Port Alice plant. Al construction work has now been completed, and it will be the policy of the present management to make no further capital expenditures that are not absolutely vital to the company's interest.

Turning to the industrial side, the company produced 51,731 tons of pulp, against 47,962 tons in 1920 and 41,834 in 1919. The company produced also 8,423,000 feet of lumber, 536,000 feet of boxes, and 53,834 bundles of shingles. At the present time two of the three plants in British Columbia are being operated at capacity, and the Swanson Bay plant will be put into operation as soon as conditions warrant.

WESTERN OIL DEVELOPMENTS

C. O. Stillman, president, G. W. Mayer, vice-president, and several of the directors of the Imperial Oil Company, visited Victoria, B.C., during the first week in October, with a view, it is understood, of obtaining oil concessions from the Provincial Government. While in Victoria, Mr. Stillman stated that the company was disappointed, though not discouraged, with the results of its exploration work in Alberta and the North-west Territories. The company has been exploring at a number of points from the international boundary between Alberta and the United States up to Fort Norman, and the exploration will be continued until some definite result is obtained. This winter, according to Mr. Stillman, the company's geologists will make a reconnaissance of the Coast district, and if sufficiently promising geological structure and conditions generally are found, and satisfactory arrangements can be made, boring probably will be commenced next year.

It is not known what view the Provincial Government will take of the company's proposals. In the spring of 1919 the D'Arcy Development Company, a subsidiary of the Anglo-Persian Oil Company, applied through its agent for a concession, giving it the sole right to prospect for oil over an area of 600 miles square in the Peace River district for a period of five years, at the end of which time the company was to select one-tenth of the area, the remainder reverting to the Government. The company was prepared to guarantee that certain work should be done, and in the event of commercial discovery it would pay the Government 12 cents per barrel royalty at the casement head, and undertake to construct a pipe-line to the coast. The Government refused the concession, and decided to investigate its own oil resources. A party of geologists were in the field during the summer of 1919, and two parties in the summer of 1920. At the recommendation of Prof. Dresser, who conducted one of the parties, a contract was given to Lynch Brothers, of Seattle, to sink bores in the vicinity of Hudson's Hope. The results up to date have been negative. Whether after this experience the Government will be disposed to give a concession to the Imperial Oil Company remains to be seen.

A syndicate of Vancouver people, headed by the Hon. Mary Ellen Smith, has been formed to bore for oil at Burns Lake, on the Grand Trunk Pacific Railway. Oil seepages are said to have been discovered in this district, and a syndicate of Burns Lake people already are testing the ground with a drill. The Vancouver syndicate has selected a site at the south end of the lake, near the ferry landing, and boring is to be started as soon as an oil-rig can be conveyed to the site.

A discovery of natural gas has been made on the farm of Davis Hall, near Revelstoke.

A large number of oil claims have been located near Terrace, in northern British Columbia. Oil seepages are said to have been discovered and the ground is being tested with a drill at one point.

The Gas Strike at Pouce Coupe.

More detailed particulars of the strike of gas at the Imperial Oil Company's well, at Pouce Coupe, near the Alberta-British Columbia boundary-line give the information that after the first strike of gas, which was estimated at two million cubic feet daily, the boiler was moved back from the well, because ignition of the gas was feared. The drill had been in operation only fifteen minutes after it was restarted when a second and stronger flow of gas, estimated at eight million cubic feet daily, was struck. The force of the flow ejected tar-sand high into the air. The drill was again stopped, as the operators thought there was every appearance of a big flow of oil being brought in, and there are no facilities for either storing or transporting it.

It is thought probable that the well will be capped, and the gas used as fuel under boilers to raise steam for power for other wells.

Since the gas strike, a number of claims have been staked and, it is understood that already arrangements have been made by four other companies to transport oil-rigs to the field over the snow during the coming winter, and start boring operations at the earliest possible opportunity in the spring.

A NEW MEASURING INSTRUMENT DEMONSTRATED AT CHEMICAL EXPOSITION.

THIS instrument is of primary design to meet a particular condition and was brought to the chemical show in order to demonstrate the conditions as met in the work of fine separation.

Owing to the fact that there has been so great an amount of favorable comment and requests to duplicate the instrument for research laboratories, bacteriological research, pathological research and general microscopic measurements work it has been decided to manufacture the instrument commercially.

Perhaps the only name for an instrument of this kind would be a "Microscopic Micrometer," it being accurate in measurements of particles or bacteria as fine as .000025 m.m. and with the use of vernier to .0000025 m.m.

The general principle of this instrument is to have a moving stage operated by a micrometer screw to pass from side to side between a finely etched line in the eyepiece and to be used in connection with either dry or oil immersion objectives. There is connected to the stage a rotary sub-stage for centreing specimens. This is actuated by the use of the worm and worm wheel built in and functioned through a thumb wheel.

Some of its uses in the chemical field might be put to the examination in measurements of crystalline substances when the chemist is endeavoring to reproduce a compound made up of numerous elements. It can be readily understood that through quantitative analyses the exact proportions of different elements might be slightly in error. If, however, the chemist understands the general microscopic structure of the elements which he may be using, he can readily tell by the size of the original crystals he is endeavoring to reproduce whether or not he has too much or too little of any of the elements in his reproductions.

Another suggested use is that in the study of bacteriology we may take a culture of bacteria during its process of incubation and measure the sizes and formations at different periods until incubation has been completed. This, of course, may find a great field in both medical and plant study.

It has also been suggested that an instrument of this kind will prove very satisfactory and helpful in the pigment industry, wherein objects almost colloidal could be measured with accuracy. It is supposed that it might be stated that the instrument, because of its extremely fine adjustment, would measure anything which can be seen through the most powerful objective.

The inventor of the instrument is Mr. A. A. Campbell of the Newark Wire Cloth Co., Newark, N.J.

LATEST CHEMICAL AND METALLURGICAL PATENTS OF SPECIAL INTEREST.

Reported to Canadian Chemistry and Metallurgy by A. E. MacRae, Ottawa.

NOTE—Readers wishing further information concerning any particular patent listed below may obtain the same by writing to Patent Office, Ottawa, Canada.

Extracting Potash From Potash Minerals and making White Cement.
A. C. Augen, Pat. 213611, Oct. 4, 1921. Mineral containing silicates of Fe and K are roasted with lime and salt, the coarser parts are seived out and reground and the whole treated under pressure in a closed vessel with steam and hot water to wash out the K. The water is separated from the solid matter which is mixed with lime and roasted to produce white cement.

Prod. of Ferro Chrome Alloys.
Wm. B. Ballantine, Pat. 213683, Oct. 4, 1921.

Process for Rendering Calcium Hypochlorite Stable.
H. Reit, Pat. 213573, Sept. 27, 1921.

Active Material for Battery Plates.
Wm. Gardiner and Wm. H. Duggan, Pat. 213797, Oct. 11, 1921. Active material for storage batteries consists of a mixture of oxide of Pb, Kieselguhr, powdered pumice stone and $(NH4)_2$ SO_4 mixed with an acid solution.

Process for Preparing Water Softening Material.
W. R. Snell, Pat. 213073, Aug. 23, 1921. $NaHCO_3$ is mixed with an Al silicate material having Base exchange properties, the mixture is formed into noodles, dried and baked at 550 to 700° to render tthe noodles resistant to the powdering action of water yet without fusing the material. The porous material is then hydrated with NaOH.

Method of Treating Polysulfid Solutions.
E. C. Holton, Can. Pat. 213099, Aug. 23, 1921.

Treating Clay for use in Manufacture of Rubber.
P. Schidrowitz, W. Feldenheimer and W. W. Plowman, Pat. 213300, Sept. 13, 1921. Clay is suspended in water with the aid of a deflocculator such as Na_2CO_3 and dried while in the deflocculated state. Clay when so treated and incorporated in rubber increases the roughness, strength distensibility and curing capacity of he rubber.

Method of Making Calcium Bisulphite Cooking Liquor.
Geo. A. Richter, Pat. 213360, Sept. 13, 1921. Bisulphite liquor containing a predetermined amount of combined and free acid is prepared by causing finely pulverized limestone to react in the presence of water with an excess of SO_2.

Process of Making Calcium Bisulphite.
Geo. A. Richter, Pat. 213361, Sept. 13, 1921. Bisulphite liquors are produced by first acidulating water with SO_2 and causing the water to react with lime. The SO_2 content of the liquor may then be increased.

Manufacture of Oxalates and Oxalic Acid.
Walter Wallace, Pat. 213376, Sept. 13, 1921.

Producing Oxalates from Formates.
W. Wallace, Pat. 213377, Sept. 13, 1921. A formate is melted in one vessel below the conversion temperature and supplied molten to a reaction vessel heated to 380-440° giving approx. 90% yield of oxalate and a minimum of carbonate.

Manufacturing Formates.
W. Wallaee, Pat. 213378, Sept. 13, 1921.

Manufacture of Formates from Carbonates.
W. Wallace, Pat. 213379, Sept. 13, 1921.

Process for the Manufacture of Borax and Boric Acid.
A. Kelly, Pat 213223, Sept. 6, 1921. Sodium pentaborate is treated with NaCl and NH_4OH. The $Na_2B_4O_7$ is crystalized out and the NH_4OH recovered for reuse. H_3BO_3 is recovered from the mother liquors.

Method of Producing Cyanamide from Calcium Cyanamide.
J. H. Lidholm, Pat. 213227, Sept. 6, 1921. $CNNH_2$ practically free from $C_2H_4N_4$ is prepared by successfully adding $CaCN_2$ to a water solution and precipitating the lime with CO_2.

Acid Sodium Pyrophosphate.
A. Kelly, Pat. 213442, Sept. 20, 1921. To a strong solution of $Na_4P_2O_7$ is added sufficient HCl to convert all the normal salt into $Na_2H_2P_2O_7$.

Manufacture of Azo-Dyestuffs from the Arylides of 2.3 Oxynapthole Acids.
A. L. Laska, Pat. 188624, Aug. 9, 1921. Azo dyes are prepared by containing a diazo or tetrazo compd. of the anthraquinone series with an arylid of 2.3 oxynapthole acid.

The Production of Cyanamide.
L. E. Friderich, Pat. 212995, Aug. 16, 1921. Powdered CaC_2 exposing the largest surface in relation to the volume is passed in counter current to N through a long furnace so that the $CaCN_2$ is removed to a cooler part of the furnace as formed.

Method of Producing Cyanamide from Calcium Cyanamide.
J. H. Lidholm, Pat. 213228, Sept. 6, 1921. $CaCN_2$ is successfully supplied to a water solution and CO. passed into the solution to keep its alkalinity below 0.5 normal.

Method of Treating and Recovering By-Products from Acid Mine Water.
J. R. Campbell, Pat. 213272, Sept. 6, 1921.

Method of Treating Mine Water.
E. C. Auld, and J. R. Campbell, Pat. 213273, Sept. 6, 1921.

BAKELITE PATENTS UPHELD.

A decision has been handed down in the United States District Court, Eastern District of New York, in favor of the General Bakelite Co. of New York in its case against the General Insulate Co. of Brooklyn. The complaint was based on alleged infringement of three of the Bakelite patents on phenol-formaldehyde condensation products covering the so-called heat and pressure process, the indurated product and the mixture and moulding patent. In each case the complainant's patents were held valid and infringed. The suit was first tried on March 31, 1919, on a bill of complaint filed Sept. 8, 1917, by the General Bakelite Co. Throughout the trial the General Insulate Co. was assisted by the Redmanol Chemical Products Co. of Chicago, whose material they used in the alleged infringing operations.

Large Order for Car Company.

The Canadian Car Company, Montreal, has received an order from the Canadian National Railways for the repair of one thousand cars. This is part of the Governments plan for helping the unemployment situation. The $2,000,000 order for new cars received two months ago by the Car Company from Russia is completed. Payment for this order was made through a Canadian Bank in Stockholm.

TANK CATALOGS.

We have received recently two new tank catalogs which appear to have very special merit.

Ontario Wind Engine & Pump Co., Ltd. "Toronto Tanks."

The development of the tank business of this company is a matter of considerable interest to Canadian manufacturers. A look through their catalog impresses one with the fact that special industrial requirements have been considered and met Here are described in detail and by illustration, tanks for dyers and cleaners, general industrial plants such as abattoirs, vinegar plants, rubber companies, color works, sprinkler tanks from 10,000 to 100,000 U.S. gallons, rectangular tanks for pickling purposes, galvanizing, bottling and ice plants, fish storage, special dye tanks for dyehouses, pickling tanks for metals, mining tanks for cyaniding, pulp thickening tanks.

Hauser Stander Tank Co., Cincinnati.

This catalog of 62 pages in booklet form contains a vast amount of special information on the action of chemicals of various kinds on specific woods. Information which tank users require is given and a special report by S. J. Hauser & Clarence Bahlman reporting quantitive tests on the chemical action of materials most generally handled in tanks. Illustrations of various styles of tank equipment make this catalog as complete and valuable as any yet put out.

COMPANY NEWS.

L. Oertling & Company announce that Sir Ernest Shackleton is taking with him one of their standard balances. It would appear that one of the most travelled balances in the world is also of their make. This balance was with Admiral Sir George Nares, in 1873, and with the late Captain Scott in 1901, and is still operating in the Engineering Department of South Kensington Museum. Fifty years' service is not a bad record.

CHEMICAL PRODUCTS, LIMITED, ANNUAL STATEMENT.

The financial position of this company, with works at Trenton, Ontario, was disclosed at their October meeting. No profit and loss statement is given, but the company is practically in a position to enter the acid phosphate field and renew operations in their sulphuric acid plant. The balance sheet as of June 30th, indicated assets at $3,630,592, of which capital assets amount to $3,031,197. This is made up of building, plant and equipment, $2,578,653. Inventories of $173,459 and capital stock subscriptions due from Ontario and Quebec Finance Corporation, amount to $393,897. Total current assets, including cash and accounts receivable, amount to $599,395. Sales since June 30th, the date of purchase from Ontario and Quebec Finance Corporation were around $45,572. Part of the assets consist of a smokeless powder plant valued at $318,162. A nitric acid plant, $341,911, pyro cotton plant, $67,147. These plants will not be operated at present.

During the first six months of 1921, ending June 30, Canada imported from the United States 8,650,815 tons of coal.

Chemical, Oil and Metal Markets

The quotations below represent manufactures' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

Chemicals.

Trading in general chemicals has revived considerably during October, and business in most lines was fairly active, and very much so compared with a few months past. Although quite a few lines decreased in price, yet there was a note of firmess to the market that has been sadly missing for some time. Indeed three of the most important of the heavy chemicals advanced; caustic soda advanced ¼c. and the ground caustic is holding firmly at a range of from $6.75 to $7.00 per cwt. and the solid at $5.50 to $6.00; refined sodium nitrate also advanced ¼c. and is quoted at $7.00 to $7.50 per cwt. Carbon bisulphide after having held firmly at 10c. has advanced to 12c. Stearic acid, both double and triple, has advanced, as has oleic acid which is now quoting at 24c per pound. Hydrochloric and sulphuric acids are in better demand and business in both these acids has improved, which is a good barometer of conditions generally in the chemical market.

It is probable that business having been so decidedly poor all summer that the present improvement is all the more noticeable and may be exaggerated by some. Nevertheless while orders are small there is more talk of contracts, which is encouraging. The demand from the paint trade is fair, and there is a slightly better demand for colors for printing inks. Yellow prussiate of soda is scarce both in the United States and England. Drugs are in fair demand, with conditions a little better than in September. There has been more activity in the rubber business which has been reflected by some better buying of chemicals by that industry. The smaller rubber concerns appear to be more active than the larger ones, and one Toronto factory is working 24 hours.

Declines have occurred in the following to the extent mentioned: Bleaching powder, ¼c.; calcium chloride, $5 per ton; corrosive sublimate, 25c.; iodine, potassium iodide, 10c.; sulphuric ether, 5c.; lead nitrate, 1c.; lead acetate, 1c.; potassium bichromate, 3c.; and sodium bichromate, 2c. The latest quotations on these are given in the price list following this report. Business in gums and waxes shows some improvement. Gum arabic has stiffened and the powdered No. 1 and No. 2 are holding firm at 28 and 27 cents respectively.

Naval Stores—The tendency in the turpentine market is toward firmer prices. Rosins are not in as good a position as turpentine, with a weak export market prevailing.

The market in linseed oil is weak and the oil cake market is practically dead. In addition to this the seed is down 5c. and inside of six weeks time the linseed crop will commence arriving from the West, and this will almost be sure to further weaken quotations on the oil.

Oils.

The petroleum oil market continues to improve after one of the worst slumps in its history which occurred this past summer. It will be remembered that from the peak price of $6.00 per gal. for Pennsylvania crude which prevailed last January the market got steadily worse as spring advanced into summer until in July, $2.25 was quoted on this grade of crude, with the Mid. Continent at $1.00. The past month has seen a decided rally in the trade and Pennsylvania crude is quoted on November 1st at $3.50, a gain of $1.25 over the August market. Fuel oil has advanced 1c. per gal.; naptha has declined ½c.; motor gasoline has advanced 1½c. per gal. So it will be seen that the efforts of the leaders of the petroleum industry to save the industry from a serious collapse have proved successful. Briefly, these efforts were the curtailing of operations at the wells until surplus stocks had been disposed of. At the present moment, when labor disputes are the order of the day, labor men should not forget that by these efforts of the leaders in the petroleum industry the business has been kept going and workmen will continue employed this winter, who otherwise might have been walking the streets.

Mr. C. O. Stillman, President of Imperial Oil Co., Ltd., returned recently from a general inspection tour of his company's operations between Toronto and Victoria, B.C., and stated that, while the results of their exploration work for oil in Western Canada were somewhat disappointing, they were not discouraged, and that they intended to pursue the search with renewed energy next season. At some camps drilling would be continued throughout the winter. Mr. Stillman believed that the exploration work at Fort Norman had not been sufficient to either prove or disprove the Arctic areas. In spite of numerous superficial evidences of the possibility of petroleum deposits, the Province of Alberta in which most of the drilling operations were being conducted, did not give the greatest encouragement from a geological standpoint, and the Alberta formation had presented unusual difficulties in drilling. In any event the Imperial Oil Company's efforts had opened up a new commercial route to the North, and already a fish canning industry had been established on Great Slave Lake.

Metals.

Providing the general strike of railroad employees in the United States does not occur the metal market should show some improvement by the end of November. As it is, lead and zinc are slightly firmer at the opening of November trade. Compared with the quotations at the 1st of October, zinc is 15c. stronger per cwt., being quoted at $6.40 per cwt. at Toronto. Lead shows an even better response with an advance of 30c. and is quoted at $5.80

per cwt. Toronto and Montreal. These quotations are for car lots. Copper remains dull, but there are signs that slightly higher levels are coming. Nickel is quiet; but there is good activity in Monel metal. Apparently Canadian industries are more and more inclined to instal Monel metal in installations and there is no doubt but that it has proved itself to be all that its producers claim.

Silver is fluctuating almost daily between 69⅜c. and 70⅝c. per ounce for Canadian silver in New York. The silver outlook depends very greatly upon general business conditions and export trade. Antimony is slightly easier; brass ingots have declined, while tin is holding at 35c. per lb. a reduction of 2c. from the summer prices. Pig iron is selling at $30 per ton, and under for quantity, at Toronto and Montreal.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals and Industrial Minerals.

Inorganic.

Alum, Ammonia, lump and ground	100 Lbs	4.75— 5.25
Ammonium Bromide	Lb.	.. — .45
Aluminium Sulphate, high grade, bags	100 Lbs.	.. — 2.50
Ammonia, Aqua 26	Lb.	.11— .12
Ammonium Carbonate	Lb.	.12— .15
Ammonium Chloride	Lb.	.09— .12
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .14
Barium Sulphate (Barytes)	Per Ton	30.00—35.00
Barium Chloride	Lb.	.05—.07½
Barium Nitrate	Lb.	.. — .20
Barium Peroxide	Lb.	.. — .20
Barium Sulphate, B.P.	Per Ton	100.00—110.00
Battery Acid, up to and including 1.400 sp. gr.	Cwt.	3.00— 3.50
Battery Acid, over 1.400, up to and including 1.835 sp. gr.	Cwt.	3.50— 4.00
Bleaching Powder, 35% drums	100 Lbs.	.04¼—.04½
Borax, crystals	Lb.	.. —.07¾
Boric Acid, powdered	Lb.	.. — .18
Bromine (technical)	Lb.	.. — .38
Calcium Carbide, car lots, f.o.b. works	Ton	.. —100.00
Calcium Carbide, ton lots, f.o.b. works	Ton	.. —105.00
Calcium Carbide, less than ton lots, f.o.b. works	Ton	.. —110.00
Calcium Chloride, fused	Per Ton	40.00—45.00
Calcium Chloride, flake	Ton	.. —48.00
Caustic Soda, ground, drum	Cwt.	6.75— 7.00
Caustic Soda, solid, drum	Cwt.	5.50— 6.00
Camphor Monobromate	Lb.	.. — 3.00
Carbon Bisulphide, in drums	100 Lb.	.. — .12
Carbon tetrachloride, drums	Lb.	.17— .19
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, Imported	Per Ton	30.00—35.00
Cobalt Oxide, black	Lb.	.. — 2.20
Cobalt Oxide, grey	Lb.	.. — 2.45
Copperas (Iron Sulphate) crystals	Lb.	.02¼—.02½
Copperas (Iron Sulphate) sugar	Lb.	.02¼—.02½
Copper Sulphate (Blue Vitriol)	Lb.	.07½—.08½
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — .95
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fuller's Earth, car lots, f.o.b. Toronto	Ton	35.00—40.00
Ferric Chloride, crystals	Lb.	.13—.14½
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid, 60%	Lb.	.. — .30
Hydrofluoric Acid, 30%	Lb.	.. — .14
Hydrochloric Acid, carboys, 18	100 Lbs.	2.25— 2.75
Hydrogen Peroxide	Gal.	.95— 1.00
Iodine, crude	Lb.	.. — 4.20
Iodine, resublimed	Lb.	.. — 4.75
Iron Oxide (red)	Lb.	.05— .13
Lead Acetate	Lb.	.14— .16
Lead Nitrate	Lb.	.15— .17
Lime, grey	Ton	.. —16.50
Lime, grey, in car lots	Ton	.. —14.00
Lime (hydrated) in ton lots	Ton	.. —23.25
Litharge	Lb.	.. — .10
Lithium Carbonate	Lb.	.. — 1.70
Lithopone	Lb.	.05½— .06
Magnesite, calcined	Per Ton	25.00—30.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.13— .16
Magnesium Sulphate	Lb.	.03½—.04½
Mag. Sulphate, B.P., Medicinal...Single	Ton	70.00—75.00
Mag. Sulphate, Technical, car lots	Ton	55.00—60 00
Muriatic Acid, 18	100 Lb.	2.75— 3.00
Nickel Salt, single, in bbl. lots	Lb.	.. — .15
Nickel Salt, single, per cwt.	Lb.	.. —.16½
Nickel Salt, double, in bbl. lots	Lb.	.. — .15
Nickel Salt, double, per cwt.	Lb.	.. —.16½
Nitric Acid, 36 carboys	100 Lb.	.09—.09¼
Phosphoric Acid, 85%	Lb.	.43— .50
Phosphoric Acid, 50%	Lb.	.29— .31
Phosphorus, yellow	Lb.	.. — .44
Potash Prussiate yellow	Lb.	.28— .30
Potassium Bicarbonate	Lh.	.. — .41
Potassium, Bromide, crystals	Lb.	.20— .27
Potassium, Bromide, granular	Lb.	.20— .27
Potassium Bichromate	Lb.	.. — .27
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — .08
Potassium Chlorate	Lb.	.. — .12
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash)	Sticks	.. — .80
Potassium Hydroxide (caustic potash) small drums	Lb.	.10— .15
Potassium Hydroxide (caustic potash) large drums	Lb.	.07—.08½
Potassium Iodide	Lb.	.. — 3.45
Potassium Nitrate, kegs	Lb.	.14— .16
Potassium Permanganate, bulk	Lb.	.65— .70
Red Precipitate (Mercuric Oxide)	Lb.	.. — 1.50
Silver Nitrate	Lb	.. —10.00
Soda Ash, bags	Cwt.	2.90— 3.00
Sodium Acetate, ton lots or over	Lb.	.. —.06½
Sodium Acetate, lesser amounts	Lb.	.. —.07½
Sodium Benzoate	Lb.	.65— .75
Sodium Bicarbonate, 100% pure	100 Lb.	3.00— 3.50
Sodium, Bichromate, bbls.	Lb.	.09— .11
Sodium Bisulphite, powder	Lb.	.. —.09½
Sodium Bisulphite, 35	Lb.	.05¼— .06
Sodium Bromide (foreign)	Lb.	.25— .30
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.. —.27½
Sodium Hyposulphite, kegs	100 Lb.	5.50— 6.00
Sodium Iodide	Lb.	.. — 4.00
Sodium Nitrate, refined	100 Lbs.	7.00— 7.50
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Peroxide, f.o.b. New York	Lb.	.38— .40
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	.. — 1.85
	Per Cwt. in Car Lots	.. — 1.75
Sodium Sulphite	Lb.	.. — .05
Sodium Prussiate, Yellow	Lb.	.15½— .18
Sulphur, ground	100 Lb.	2.75— 3.25
Sulphur, roll	100 Lb.	4.50— 4.75
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.25— 2.75
Sulphuric Acid, 66 Be, tank cars		.. —24.00
Talc, No. 1 grade	Ton	.. —30.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	.. —18.00
Tin Chloride, crystals	Lb.	30 — .35
Tri-sodium Phosphate	Lb.	.08½— .09
Ultramarine, Blue	Lb.	.15— .35
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 1.75
Whiting (English)	Ton	.. —35.00
Whiting (American)	Ton	.. —30.00
Whiting	Per Ton	35.00—40.00
Zinc Sulphate, com.	Lb.	.05¾—.06½
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.9½—.10½
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.. — .55
Acetic Acid, glacial, carboys, f.o.b. Shawinigan Falls	Lb.	.. —.22½
Acetic Acid, glacial, bbls., f.o.b. Shawinigan Falls	Lb.	.. — .22
Acetic Acid, 28%, carload lots	Lb.	.. —.04½
Acetic Acid, 28%, 25 bbl. lots	Lb.	.. —.05¼
Acetic Acid, 28%, 15 bbl. lots	Lb.	.. —.05½
Acetic Acid, 28%, 10 bbl. lots	Lb.	.. —.05¾
Acetic Acid, 28%, 5 bbl. lots	Cwt.	.. — 5.85
Acetic Acid, 28%, 3 or 4 bbl. lots	Cwt.	.. — 5.90
Acetic Acid 28%, 1 or 2 bbl. lots	Lb.	.. — .08
Acetic Acid, 80%, carload lots	Lb.	.. — .12
Acetic Acid, 80%, 25 bbl. lots	Lb.	.. — .14
Acetic Acid, 80%, 15 bbl. lots	Lb.	.. — .15
Acetic Acid, 80%, 10 bbl. lots	Lb.	.. —.15½
Acetic Acid, 80%, 5 bbl. lots	Lb.	.. — .16
Acetic Acid, 80%, 3 or 4 bbl. lots	Lb.	.. — .17
Acetic Acid, 80%, 1 or 2 bbl. lots	Lb.	.. —.17½
Acetone, pure, drums or over	Lb.	.. —.19½
Acetone, pure, lesser amounts	Lb.	.. — .25
Aspirin, in 100-lb. lots	Lb.	.85— .95
Alcohol, Absolute Ethyl, case of 1 doz 1-lb. bottle	1-lb. bottle	.. — 2.15
Alcohol, Absolute Ethyl, in steel drums of 10 gallons capacity	Imp. Gal.	.. —15.00
Alcohol, acetone, bbls. or over	Gal.	.. — 1.05
Alcohol, acetone, lesser amounts	Gal.	.. — 1.35
Alcohol, pure, bbl., 65% O.P.	Gal.	.. —10.50
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 1.15
Alcohol, wood, 95%, half bbl. lots	Gal.	.. — 1.25
Alcohol, wood, 95%, lesser amounts	Gal.	.. — 1.30
Alcohol, wood, 97%, bbls.	Gal.	.. — 1.20
Alcohol, wood, 97%, half bbl. lots.	Gal.	.. — 1.35
Alcohol, wood, 97%, lesser amounts	Gal.	.. — 1.50
Amyl acetate, technical	Gal.	4.50— 5.00
Amyl acetate, pure	Gal.	5.50— 6.00
Benzaldehyde	Lb.	1 35— 1.60
Benzoic Acid	Lb.	.. — .90
Caffeine, English	Lb.	.. — 8.50
Calomel (Mercurous Chloride)	Lb.	.. — 1.40
Camphor, refined, slabs	Lb.	.. — 1.15
Camphor, refined, tal	Lb.	.. — 1.22
Carbolic Acid, white crystals	Lb.	.57— .75
Chloroform	Lb.	.55— .60
Citric Acid, domestic, crystals	Lb.	.65— .70
Coumarin	Lb.	.. — 6 00
Cream Tartar, 98%	Lh	.25— .30
Dextrine, potato	Lb.	.. — .09
Dextrine, corn	Lb.	.. — .09
Ether, B.P. conc.)	Lb.	.. — .63
Ether, Sulphuric	Lb.	.30— .40

Formaldehyde, bbls. or over	Lb.	.. — .15
Formaldehyde, 200-lb. kegs	Lb.	.. —.19½
Formaldehyde, 100-lb. kegs	Lb.	.. —.20½
Formaldehyde, 50-lb. kegs	Lb.	.. —.21½
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	5.00— 5.25
Fusel oil, refined	Gal.	.. — 6.00
Gallic Acid	Lb.	1.25— 1.75
Glycerine, C.P., single tin of 56 lbs.	Lb.	.. — .26
Glycerine, C.P., two or more tins	Lb.	.. — .23
Glycerine (pale straw) single tin 56 lbs.	Lb.	.. — .25
Glycerine (pale straw) two or more tins	Lb.	.. — .22
Hexamethylenetetramine		1.10— 1.50
Oxalic Acid	Lb.	.14— .20
Oleic Acid	Lb.	.. — .24
Phenacetin	Lb	3.10— 3.50
Phenolphthalein	Lb.	.. — 1.80
Pyrogallic Acid	Lb.	3.00— 3.50
Quinine	Oz	1.00— 1.10
Saccharin	Lb.	3.50— 4.00
Salicylic Acid	Lb	.. — .35
Starch, corn, ground, car lots	Lb.	.. —.04½
Starch, potato, ground, car lots	Lb.	.. —.07½
Stearic Acid, Double Pressed	Lb.	.17— .18
Stearic Acid, Triple Pressed	Lb.	.19— .20
Tartaric Acid, crystals or powdered	Lb	.39— .44
Tannic Acid, commercial	Lb	.45— .65

Rubber.

The following quotations on rubber are in American funds. New York delivery:

Crude.

Para, upriver	Lb.	.. —.21¾
Caucho Ball, upriver	Lb.	.. — [illegible]

Plantation Rubber.

1st Latex Crepe	Lb.	.. — .17
Smoked Sheet	Lb.	.. —.16½

Scrap Rubber.

Boots and shoes	Lb.	.04— 05
Automobile tires	Lb.	.. — .01
Steam and fire hose	Lb.	.. —.01¼
Inner tubes, No. 1	Lb.	.. — .08
Inner tubes, No. 2	Lb.	.. —.05¾

Tanning and Dyeing Materials

Fustic Crystals	Lb.	.28— .32
Hematine Crystals	Lb.	.20— .26
Logwood Crystals	Lb.	.20— [illegible]
Quercitron Liquid Extract	Lb.	.06¾—.07½
Liquid Sumac Extract	Lb.	.07½—.08½
Ground Sumac	Ton	60.00—65.00

Chestnut Liquid Extract	Lb.	.02¼—.02¾
Hemlock Liquid Extract	Lb.	.04½—.04¾
Quebracho Liquid Extract	Lb.	.03½—.03¾
Quebracho Solid Extract	Lb.	.05—.05½
Liquid Blended Extract (Canadian)	Lb.	.04—.04½

Metals.

Aluminium, No. 1, 98-99%	Lb.	.. — .28
Antimony	Lb.	.. —.07½
Brass, yellow ingots	Lb.	.. —.10½
Brass, red	Lb.	.. —.13½
Cobalt, metal	Lb.	3.30— 3.50
Copper, electrolytic, small lots	Cwt.	.. —16.25
Copper, electrolytic, car lots	Cwt	.. —15.75
Copper, casting, small lots	Cwt.	.. —15.75
Copper, casting, car lots	Cwt.	.. —15.25
Gold, Pure	Oz.	23.00—25.00
Iron, Pig	Ton	.. —30.00
Lead, pig, small lots	Cwt.	.. — 6.30
Lead, pig, car lots	Cwt.	.. — 5.80
Magnesium, ribbon	Oz.	.. — 1.50
Magnesium, ribbon,	Lb.	.. —18.00
Magnesium, powder	Lb.	3.00— 3.50
Mercury	Lb.	1.10— 1.25
Monel Metal, shot	Lb.	.. — .41
Monel Metal, sheet, hot rolled, on orders of over a thousand lbs. of one gauge	Lb.	.. — .64
Monel Metal, Rods, hot rolled	Lb.	.. — .49
Monel Metal, rods, cold rolled	Lb.	.. — .66
Nickel, shot or ingot	Lb.	.. — .35
Platinum, pure	Oz.	85.00—90.00
Silver, bar, American silver	Oz	.. —.99¼
Silver, bar, Canadian produced, U.S. funds	Oz.	.. —.70⅝
Steel, mild, ¼ inch, base price	Cwt.	.. — 3.25
Steel, mild, 3/16 inch, base price	Cwt.	.. — 3.75
Steel, nickel, in bars, 3½% nickel	Lb.	.. — .20
Steel Sheet, 28 guage, size 30"	Cwt.	.. — 6.10
Steel Sheet, 28 guage, size 36"	Cwt.	.. — 6.30
Tin	Lb.	.. — .35
Zinc, sheets	Lb.	.. — .15
Zinc (spelter) small lots	Cwt.	.. — 6.90
Zinc (spelter) car lots	Cwt	.. — 6.40

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. —.32½
Motor Gasoline (service stations)	Gal.	.. —.36½
Lighting Gasoline	Gal.	.. —.37½
Naphtha	Gal.	.. —.31½
Coal Oil	Gal	.. — .20
Fuel Oil, tank wagons	Gal.	.. — .10
Fuel Oil, tank cars	Gal.	.. — .09
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 1.50
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 3.50
Crude Creosote Oil, bbls.	Gal.	.. — .40
Refined Creosote Oil, bbls.	Gal.	.. — .55
Crude Coal Tar	Bbl.	.. — 9.25
Refined Coal Tar	Bbl	.. —10.50
Coal Tar Pitch, bbls.	Cwt.	.. — 1.75
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52—.57
Dip Oil, 20 per cent.	Gal	.38— .46
Crude Carbolic Acid, 30 per cent.	Gal	.. — .75
Naphthalin flake	Lb.	.. — .10
Naphthalin Balls	Lb.	.. — .1[illegible]
Alpha-Naphthylamin	Lb	.. — .51

Flotation Oils and Naval Stores.

Rosin, Grade G, in 280 bbl. lots		.. — 9.00
Rosin, Grade W W., in 280 bbl. lots		.. —10.00
Turpentine, spirits, single bbls.	Imp. Gal.	.. — 1.15
Turpentine, spirits, 2 to 4-bbl. lots	Imp. Gal.	.. — 1.14
Turpentine, spirits, 5-gal. container	Imp. Gal.	.. — 1.30

Waxes, Gums, Vegetable and Essential Oils.

Essential Oils—

Cedar, leaf	Lb.	.. — 2.00
Cedar, wood	Lb.	.. — 1.15
Camphor	Gal.	.. — 1.10
Camphor, white	Lb.	.. — 1.00
Peppermint, American	Lb.	.. — 3.00
Peppermint, re-distilled, B.P.	Lb.	.. — 3.25
Peppermint, Japanese	Lb.	.. — 1.50

Vegetable Oils—

Anise Oil	Lb.	.. — .80
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .2[illegible]
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .19
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.14— .16
Corn Oil, in bbls.	Lb.	.. — .10
Corn Oil, tank cars	Lb.	.08—.08½
Cottonseed Oil, crude, f.o.b. Mississippi Valley points	Lb.	.. —.05¾
Cottonseed Oil, crude, f.o.b. Texas points	Lb.	.. —.05½
" Oil, summer yellow, f.o.b., Chicago	Lb.	.. — .07
" Oil, winter yellow, f.o.b. N.Y.	Lb.	.. — .08
Linseed Oil, raw, single bbls.	Imp. Gal.	.. — .87
Linseed Oil, raw, 3 to 5-bbl. lots	Imp. Gal.	.. —..86
Linseed Oil, raw, 6 to 9-bbl. lots	Imp. Gal.	.. — .84
Monopole Oil	Lb.	.. — .18
Olive Oil, foots, at Toronto	Lb.	.11½— .12

Gums—

Indian, No. 1A	Lb.	.. — .34
Indian, No. 1	Lb.	.. — 30
Tragacanth, No. 1, Ribbon	Lb.	.. — 4.00
Tragacanth, No. 1, Flake	Lb.	.. — 3.00
Tragacanth, Turkey	Lb.	.. — 2.90
Arabic, clear amber sorts	Lb.	.. — [illegible]
Arabic, regular grain No. 4 and No. 6	Lb.	.. — 22
Arabic, regular grain No. 2	Lb.	.. —.22½
Arabic, white sorts	Lb.	.. — 40
Arabic, powdered, No. 1	Lb.	.. — .28
Arabic, powdered, No. 2	Lb.	.. — .27

Waxes—

Beeswax, various grades	Lb.	.39— .61
Paraffin, 128°—130°, M.P.	Lb.	.. — .22
Paraffin, 118°—120°, M.P.	Lb.	.. — .19
Paro Wax, blocks	Lb.	.. — .20
Shellac, T.N.	Lb.	.. — .84

Fertilizer Materials.

Acid Phosphate	Ton	.. —30.00
Animal Tankage, per unit of Ammonia		.. — 2.00
Animal Tankage, per unit of Bone Phosphate of lime		.. — .10
Nitrate of Soda	Ton	.. —75.00
Muriate of Potash	Ton	.. —76.00
Pure Ground Blood, per unit of Ammonia		.. — 2.25
Steamed Bone Meal	Per Ton	.. —45.00
Sulphate of Ammonia	Ton	.. —65.00

C. P. Chemicals.

Ammonia, C.P.	Lb.	.. — .27
Hydrochloric Acid, C.P.	Lb.	.. — .16
Nitric Acid, C.P.	Lb.	.. — .24
Sulphuric Acid, C.P.	Lb	.. — .15

Industrial Gases.

Acetylene, cylinders	per 100 cu. ft.	2.55— 3.00
Coal Gas, cylinders	per 100 cu. ft.	3.00— 4.00
Hydrogen (cylinders)	per 100 cu. ft.	1.00— 1.60
Nitrogen, cylinders	100 cu. ft.	3.00— 4.00
Nitrogen, cylinders	per 100 cu. ft.	1.40— 2.50

ONTARIO'S MINERALS

PROVINCE OF ONTARIO

DEPARTMENT OF MINES

Hon. H. Mills, Minister

Ontario, in 1920, Contributed 36 Per Cent. of the Total Mineral Output of Canada.

The following table, subject to revision, summarizes the mineral production of Ontario for 1920. As far as possible the figures represent quantities shipped and values received for marketed products. Tons throughout are short tons of 2,000 pounds. Final figures for 1919 are included for comparison.

Summary of Mineral Statistics, 1920.

Product.		— Quantity — 1919	1920	— Value — 1919	1920
Metallic:					
Gold	ounces	505,964	564,309	$10,451,709	$11,665,735
Silver	"	11,363,252	10,968,358	12,904,312	10,819,678
Platinum metals	"	1,770	282	200,000	18,009
Copper	lbs.	5,684,183	6,825,772	969,024	1,041,994
Nickel, metallic	"	10,202,308	11,015,692	3,592,984	3,852,141
Nickel oxide	"	1,498,577	4,890,571	341,833	1,151,490
Cobalt, metallic	"	121,926	167,760	243,554	392,926
Cobalt oxide	"	426,573	569,182	624,553	1,210,810
Other Cobalt compounds	"	199,487	1,717	141,372	1,629
Nickel, sulphate & carbonate	"	353,267	159,725	46,711	15,362
Lead, pig	"	1,529,987	2,247,914	94,507	180,951
Copper in matte (a)	tons	9,431	11,715	2,740,663	2,928,750
Nickel in matte (a)	"	15,581	21,371	7,990,403	10,685,500
Iron ore, exported (b)	"	5,953	6,769	48,341	59,647
Iron, pig (c)	"	46,769	76,164	1,200,793	2,204,205
Metallic total		....	....	$41,590,759	$46,228,827
Non-Metallic:					
Actinolite	tons	160	100	$ 1,176	$ 1,160
Arsenic, crude and white	lbs.	5,668,170	3,765,611	485,360	431,527
Clay products—					
Brick, common	M	141,255	115,420	1,966,711	2,047,543
Brick, fancy and pressed	M	31,738	29,254	589,908	724,031
Tile, drain	M	13,009	7,792	354,700	263,429
Tile, hollow building	tons	17,425	....	184,900	317,233
Tile, roofing		....	....	1,692	3,379
Pottery		....	....	119,551	127,049
Sewer pipe		....	....	609,100	860,811
Cement, Portland	bbls.	2,022,575	2,035,594	3,659,720	4,377,814
Corundum	tons	....	196	....	27,000
Feldspar	"	14,787	16,760	88,663	122,569
Fluorspar	"	3,425	3,704	60,389	67,381
Graphite, crude and refined	"	1,340	1,956	99,841	132,882
Gypsum, crushed, ground and calcined	"	59,899	74,707	278,111	404,162
Iron pyrites	"	117,178	148,651	366,422	618,283
Lime	bush.	3,911,572	4,320,225	1,268,290	1,532,627
Mica	tons	567	717	56,199	51,493
Mineral Water	Imp. gals.	276,833	127,150	19,290	11,500
Natural Gas	M. cu. ft	11,085,819	11,500,000	2,583,324	3,450,000
Peat	tons	500	3,900	1,750	15,600
Petroleum, crude	Imp. gals.	7,703,515	6,361,234	632,789	724,145
Phosphate (apatite)	tons	2	....	31	....
Quartz (silica)	"	69,658	94,650	179,070	366,441
Salt	"	148,112	206,612	1,395,368	1,544,867
Sand and Gravel	cu. yds.	1,065,851	2,000,000	501,666	1,300,000
Sand-lime Brick	M.	27,661	27,703	367,815	410,952
Stone, building, trap, granite, etc.		....	....	1,230,922	2,074,944
Talc, crude and ground	tons	17,571	15,990	240,399	269,182
Total non-metallic		....	....	$17,293,157	$22,227,954
Add metallic		....	....	41,590,759	46,228,827
Grand Total		....	....	$58,883,916	$68,456,781

(a) Copper and Nickel exports in the form of matte were, in 1919, valued at 14 and 25 cents per pound, respectively, and at 12½ and 25 cents in 1920.

(b) Total shipments of iron ore were 195,915 tons in 1919, and 126,710 tons in 1920.

(c) Production from Ontario ore only. Total output of blast furnaces was 623,586 tons of pig iron, worth $16,010,537 in 1919, and 748,193 tons, valued at $21,652,308, in 1920.

Dividends and Bonuses paid to the end of 1920 amounted to $18,502,166 for gold mining companies, and $82,403,185 for silver mining companies, or a total of $101,205,351.

The Provincial Assay Office, at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Price List, which may be obtained on application.

For illustrated reports, geological maps, mining laws, and list of publications, apply to

THOS. W. GIBSON, Deputy Minister of Mines,
TORONTO, ONT.

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Send us your orders now as stock is limited.

No. 00—FOR SPECIAL SCIENTIFIC WORK—Washed with hydrofluoric and hydrochloric acids. 100 filters in a package, five packages in a box of birch bark.

Diameter, cm.	9	11	12.5	15
Per 100 filters	2.40	3.00	3.30	3.75

No. 0—WASHED FILTERS—Washed with hydrochloric acid, removing traces of iron, alumina, lime, etc. The ash is reduced to a minimum, and a high standard of purity is secured. A uniform and quick filter, retaining fine precipitates; adapted to the most precise requirements of analytical work. 100 filters in a package, five packages in a box of birch bark.

Diameter, cm.	9	11	12.5	15
Per 100 filters	1.26	1.65	1.89	2.55

No. 0B—WASHED FILTERS—Washed in hydrochloric acid. Same quality as No. 0, but heavier; filtering more rapidly and retaining the finest precipitates. 100 filters in a package, five packages in a box of birch bark.

Diameter, cm.	9	11	12.5	15
Per 100 filters	1.44	1.89	2.10	2.85

No. 1F—Of best linen material. Retains the finest precipitates.

Per ream of 480 sheets, size 48 x 48 cm.	\$60.00
Per quire	3.60

100 filters in a package, five packages in a box of birch bark.

Diameter, cm.	9	11	12.5	15	18.5
Per 100 filters	.75	.90	1.20	1.50	2.25

ALL OF THE ABOVE PRICES SUBJECT TO $33\frac{1}{3}\%$ DISCOUNT

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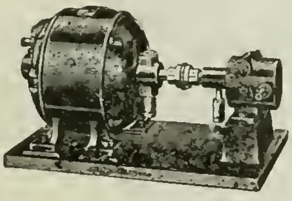

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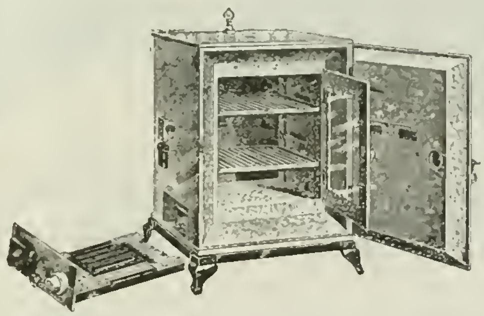
for producing moderate pressure and vacuum. Excellent for blast lamps, small furnaces, vacuum filtration, etc.



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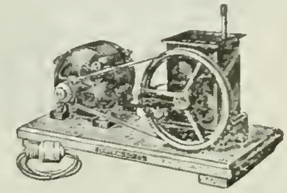

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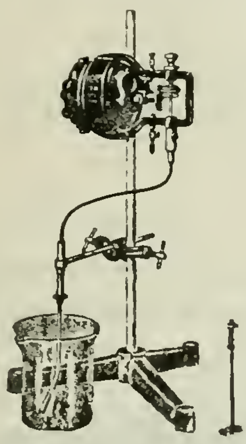

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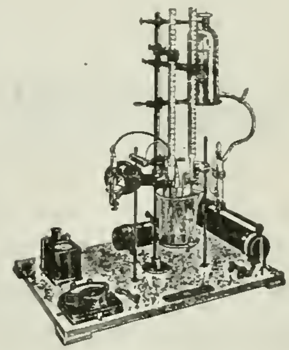

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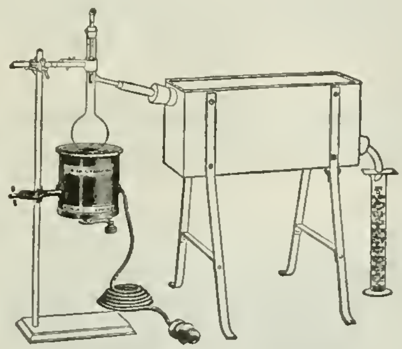
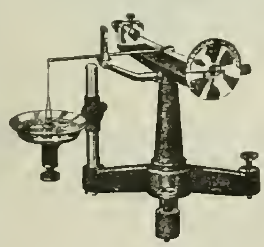
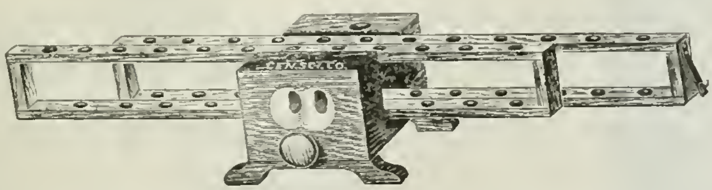
is the most economical and complete of the new types of apparatus for determining Hydrogen Ion and for end-point determinations in acid-alkali and oxidation-reduction reactions.



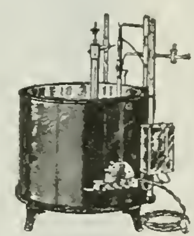
CENCO ELECTRIC HEATERS
may be used for a variety of purposes in the laboratory. They are widely used in the distillation method of testing gasoline, for Kjeldahl digestions and distillations, for distillation of inflammable liquids of high boiling point, ashing easily volatile material, etc.



DU NOUY SURFACE TENSION APPARATUS
provides the most rapid and direct method for such determinations. It is the only convenient method for colloidal fluids. Especially valuable in biochemical work.



THE COOLEDGE COMPARATOR
provides a simple and convenient means of handling color tubes in the routine colorimetric determinations of PH.



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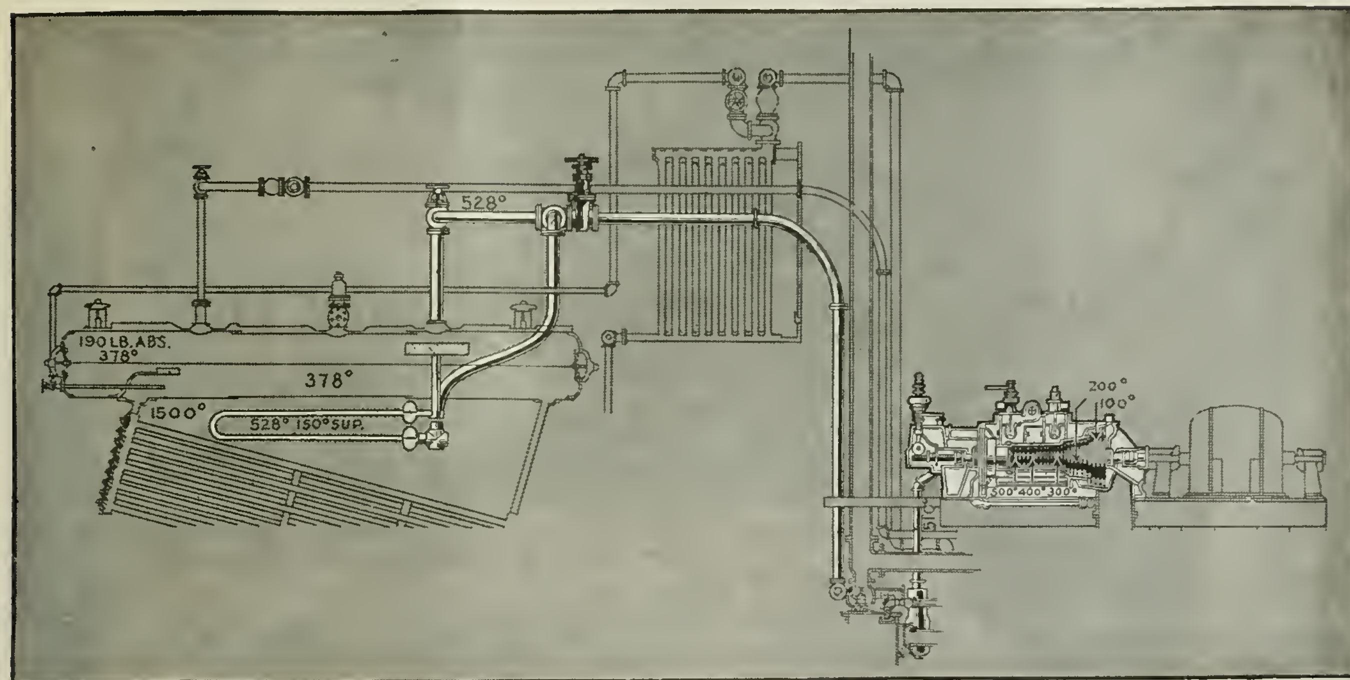

Monel Metal for Superheat

HIGH machine speeds, constantly increasing demands on already installed steam lines, have forced power plants to superheat.

Commonly used "steam" metals cannot survive the chiseling attack of steam, superheated and under high pressures. So leading designers specify Monel metal.

Monel is used for guide stems, wedges, seat rings, spindles, pistons, etc., in great valves built by Chapman, Crane, Jenkins, Lunkenheimer, Nelson, Pratt & Cady, and others equally prominent. It is used as blading, poppet valve parts, etc., in large steam turbines.

In power plant condensing and auxiliary apparatus, Monel is used as meter parts, valve trim, pump rods and liners, etc. For only Monel combines the strength of steel with the ability to withstand the combined chemical and mechanical attack of high pressure and superheated steam, most acids and alkalies. Steam wear and water slippage is reduced to the minimum, machine life is lengthened, service is uninterrupted by costly shut-downs and expensive repairs.

Monel is being rapidly adopted for service calling for acid, alkali, high heat and steam wear resistance. It has a prominent place in the specifications of the largest organizations in the country.

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Harbor Commission Building, Toronto, Ontario

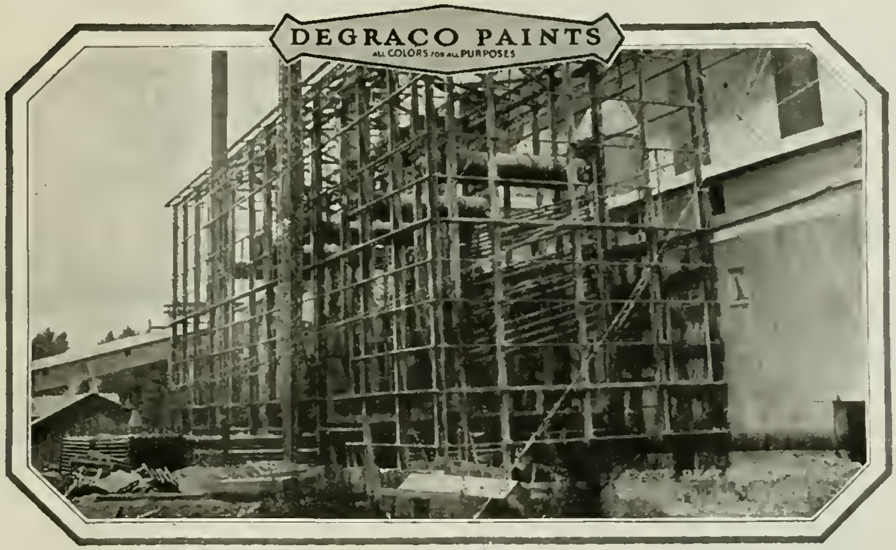
The name Monel identifies the natural nickel alloy—67% nickel, 28% copper and 5% other metals—produced by The International Nickel Company. Monel products include Monel blocks, Monel rods, Monel castings, Monel sheet, Monel wire, Monel strip stock, etc.

INCo

MOnel metal

THE INTERNATIONAL NICKEL COMPANY

INCo MONEL METAL INCo NICKEL



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Good paint that has proven service records back of it, is unquestionably the best investment in the long run. It does the job you pay to have it do — protects surfaces on which it is applied — eliminates frequent repaintings—cuts down repair and replacement costs.

Degraco Paints, through service records in the chemical field, are known as good paints. Year after year they insure protection at lowest ultimate cost. You eliminate the hazard of experiment when you use **Degraco Paints.**

Degraco Paints are made in all colors under acid-resisting formula for exposure to fumes in chemical plants. **Degraco Paints** include:

Superior Graphic Paint for the protection of structural steel and metal.

Sta-White—the pure white oil paint for walls and ceilings.

Degraco Colors for houses and industrial use.

Degraco-Tone—the flat wall paint.

Degraco Brick and Concrete Paints.

Enamels, Damp-proof Coatings, Gas Holder Paint and a score of others.

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(78

Sta-White— *a pure white, light-reflecting oil paint for industrial interiors. It stays white. The mill white you can rely upon.*

Superior Graphite Paint—*a protective coating for structural steel, bridges, metal roofs, stacks and all metal surfaces.*

Degraco Paints, Varnishes and Enamels *are made in all colours for interiors and exteriors, for every service requirement.*

Degraco Brick and Concrete Paints—*for interiors and exteriors. Concrete Walls, Floor Paint, Floor Hardener, Damp-proofing.*

Degraco-Tone—*an oil paint in flat finish for interior use on plaster walls, woodwork, wall board, concrete, tile, metal ceilings.*

DEGRACO

Paints - Varnishes - Enamels

CANADIAN CHEMISTRY AND METALLURGY

Formerly "Canadian Chemical Journal."

THE OFFICIAL JOURNAL OF THE CANADIAN INSTITUTE OF CHEMISTRY

Vol. 5 TORONTO, DECEMBER, 1921 No. 12

P. F. McCLEARY. Associate Editor. T. LINSEY CROSSLEY, Editor. L. E. WESTMAN, Business Manager.

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FROM THE PUBLISHERS---

READ THIS MESSAGE EVERY MONTH

Col. Henry Cockshutt. Lieutenant-Governor of Ontario, is a most prominent business man, recognized as such throughou the Dominion.

Speaking before a group of members of the Canadian National Newspapers and Periodicals Association recently, he paid a most distinctive tribute to the technical and business newspapers of the country. He said:—"I make a distinction between business newspapers and the daily press, because I believe that your papers—the business newspapers of Canada—exert a greater influence than the daily press, because of the greater confidence your readers have in them. What they read in the daily newspapers to-day is forgotten to-morrow; but this is not the case with the business newspaper. Business men need the service of these papers in the conduct of their everyday business life."

Because we are quoted as authorities, we aim to live up to the high trust placed in us by business men. Our aim is to put out a paper so that every clipping is a sane, truthful, unbiased piece of information, which you can use and follow without loss or danger. Our news must be correct in scientific accuracy and detail. Again taking up the exact words of Col. Cockshutt, we find further confidence expressed:—"On your shoulders, therefore, perhaps more than on the shoulders of any other single agency, rests the obligation to meet the needs of these trying days, with a sane and sound presentation of the case as it exists at the present time, a presentation free from bias, or the desire to serve a popular demand."

"You can, and, I believe, will be one of the largest factors in helping to bring about a satisfactory readjustment of the business conditions of this country."

This service, then, is our function and the business of CANADIAN CHEMISTRY AND METALLURGY. Subscribers, readers and advertisers should co-operate with us to make it 100% possible.

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EDITORIALS

A WONDERFUL OPPORTUNITY?

Proposals of Mona Petroleum Products, Limited.

THE letter which we quote in full below is undoubtedly one of the most remarkable documents ever sent forth by a stock-selling organization. It is being sent out by the Oil Shares Brokerage, Limited, who claim to be fiscal agents for Mona Petroleum Products, Limited. Both organizations have offices at Toronto.

We have no quarrel with anyone who may claim that gasoline has been made by so-called processes of cracking from more complex hydrocarbons; but we do submit that the chemistry set forth in this letter is new and quite contrary to accepted knowledge. To obtain from a hydrocarbon and steam a substance in the liquid form with the composition NHO_2 (which would be HNO_2 if written that way), is some accomplishment. To sell stock on the claim that this material is a carbonless gasoline and a better motor fuel than ordinary gasoline is in our humble opinion a scheme which smacks so much either of fraud or insanity that it should be immediately prohibited by law.

Herewith we reproduce exactly this masterpiece of high finance, which appears as a general circular letter of Oil Shares Brokerage, Limited. The sentence structure conforms with the original. This particular letter was undated but was mailed very recently.

Mona Petroleum Products, Ltd.

> Dear Sir: In reference to business opportunities, no doubt you are interested in "Investing for Profits." I now take pleasure in bringing to your attention, an opportunity that only comes once in a life time.
>
> If I can show you an Investment which can pay 10 per cent. per month, and convice you, to your entire satisfaction, that we have a proposition which will pay such, you, as a sane business man, no doubt, will see your way clear to get in on the ground floor of this "The Parent Company."
>
> Dr. J. W. Trotter, Petroleum Engineer, Scientist and Inventor, has a process for the manufacture of CARBONLESS Gasoline, which will give 25 to 50 per cent. more power, and consequently 25 to 50 per cent. increase in mileage per gallon, than the ordinary Gasoline used in automobiles, etc.
>
> Dr. Trotter obtains 125 to 130 gallons of CARBONLESS Gasoline from every 100 gallons of common kerosene.
>
> This may seem impossible to the average man, but you will agree with me, that we now live in a modern age, things, which seemed impossible not long ago, are now an every day occurrence.
>
> I will show you how it is possible to convert 100 gallons of Kerosene into 125 gallons of Carbonless Gasoline.
>
> Assume that the two circles below represent two stills, the left one contains 100 galls. of Kerosene, and the right one 100 galls. of water, you are well aware that water and oil will not mix, we must, therefore, break them up into their component parts, and in doing so we have to apply heat. By superheating the water, we bring it to 1,100 deg. F. and by applying the same method to the Kerosene we bring it to 600 F., both are now invisible gases."

At this point comes a diagram, drawn in ink, showing two connected circles representing 100 gals. of kerosene at 600° F. and labelled NCHO, and 100 gal. of water, at 1100° F., represented by H_2O. The pressure is given at 180 lbs. per sq. in. The formula to represent the reaction is in ink also as follows: ($NCHO + H_2O - CO_2 + CO + H_2$) = NHO_2 or CARBONLESS GASOLINE.

> The formula for water is Hydrogen two parts to one of Oxygen. These gases we force into the Kerosene vapour under a pressure of 180 lbs. per sq. in. Oxygen being carbon's deadly enemy, immediately attacks the carbon and destroys it. this passes off as Carbon Monoxide and Carbon Dioxide, and the Hydrogen being the lighter of the two gases, escapes also through valves provided for this purpose.
>
> Do not think for one moment that all the Oxygen is required to destroy the carbon, it is not, a large quantity is absorbed by the molecules of Kerosene while held in suspension. The gases are then converted by means of condensation, to their fluid state, we then find that we have 125 galls. of CARBONLESS Gasoline, with the expansion and explosive qualities nearly doubled.
>
> You doubtless know that most of the oil comes at present from U.S.A., Dr. Trotter having been Petroleum Production Expert and Engineer for the Standard Oil Co. for over 20 years, should be correct in the following figures:
>
> We can buy all the Kerosene we require, for about 3 cents per gall., but to be on a conservative basis we are putting the price at 7 cents per gall., or

$7.00	per 100 gallons
3.00	freight
1.50	duty
1.15	exchange, based on 15c., now only 10c.
3.00	production charges, including overhead.
$15.65	TOTAL COST.

Present wholesale price per 100 galls. of gas	$34.00
Cost of Mona to produce	15.65
Net	$18.35

> When you consider that the initial unit to be installed by Mona Petroleum Products, Ltd., will have a daily capacity of 1,600 barrels, or 72,000 galls. of Kerosene from which is obtained 90,000 galls. of

CARBONLESS Gasoline, one begins to realize the tremendous money-making possibilities of this Company.

For instance, take gall. for gall., 72,000 galls. at a profit of 18c. per gall. would be: $12,960 net profit per day of 24 hours; or $388,800 per month; or $4,665,600 per year, on a capitalization of $500,000.

Taking into consideration the 25% increase or 18,000 galls. which has cost us nothing, we have:

72,000 galls. @ 18c.	$12,960
18,000 galls. @ 33c.	5,940
Per day	$18,900

For quick figuring, let us call this $20,000, for 30 days we have a net profit of $600,000. Impossible you may say, that is far too big, so we will divide it by eight, or cut these figures in two, four times, until we have only $75,000 per month, or $900,000 annually. This, on our capitalization of $500,000 returns a net profit of 180%. But you will certainly concede that no sane business man, with any knowledge at all of their business could make such an error in costs as to require to cut their figures in two, four times.

You still may say, that is a big dividend to pay, but when you consider that other Refineries only recovering 33 units of gas from 100 units of Crude Oil are paying from 75% to 300% per year, what will we pay recovering **75 units** from the same grade of oil? An increase of 42% and in addition, absolutely free from Carbon, or in other words CARBONLESS GASOLINE.

I am forwarding a Copy of testimonial from Client who obtained over 100% increase in Mileage, and you or your friend can obtain the same result from Mona Gasoline.

Kindly give this deep and thorough investigation, and get in on the Holding Company while the shares are selling at $10 each. I can assure you that a few days more will close up this, the Parent Company.

Trusting to hear from you by return mail,

Yours very truly,
(Signed) S. FAIRN.

"One good investment is worth a lifetime of toil."

IN TOUCH WITH THE PUBLIC.

TWO men were talking. Said one, emphatically, "If this board were composed of experts, they would get out of touch with the public." We heard no more, but that proposition stayed with us.

Did the speaker have in mind that, as a matter of principle, boards to consider any proposition should be composed of men "intelligently ignorant" of the question."

Apparently the proper idea is for such boards to be composed of men prominent in any line other than that to be considered, plus a well-known lawyer or two. These men have had much experience keeping in touch with the public. They can engage the experts, who can thus keep in touch with the board. The board finds out what the experts know and pass it on to the public along with a very considerable spread in the costs. That's why it is referred to as "keeping in touch with the public."

But the business man and the lawyer are experts, too, in commerce and law. Logically, if experts are not to be used, the board should be composed of men not especially experienced in anything.

We could guess that our street friend had in mind a limited definition of the word—that it applied only to men of extraordinary experience in medicine, toxicology, chemistry, engineering, electricity or industrial technology—that these men were not capable of discussing a problem in their own sphere of experience in such a way as to serve the public.

Was he right? Is it necessary in important technical matters for prominent business men and lawyers to translate to the public information as to subjects with which they have no experience because the average professional man cannot do so?

Is there not something lacking in the training of technical men? These men are public servants, just as the business man and lawyer.

When the student in applied science has something to investigate, why should he not be required to put his observations in terms not only of good English but in language as free from technicalities as is consistent with sufficient presentation of the facts? A man who knows what he's talking about cannot be of use to the men who need his knowledge unless he can convey it. He is but "sounding brass or a tinkling cymbal."

Is it not this lack in the expert which keeps him out of touch with the public and makes it necessary for him to pass his knowledge on through boards of ordinary mortals with much loss in transmission?

THE CONSULTING CHEMIST.

A RESEARCH designed to disclose the daily mental processes of a consulting chemist would, we are sure, bring forth remarkable results. The chemist employed by a large organization on research or other work, begins to wonder how it ever was possible for anyone to pay his salary just as soon as he begins to do business for himself. One way of measuring the development of a profession is to look at those of its membership who are employed in a consulting capacity. When this is applied to chemistry it is easy to believe that the profession as a whole is very young, very poor, and utterly unorganized. In spite of the fact that we have such large organizations of salaried chemists, the public does not soon come to realize that they exist because so few of them actually seek business in the ordinary way.

A director of one of the largest retail organizations in Canada, whose firm employs several chemists, was amazed to learn that there were any

chemists who did not do the things that his routine staff were doing. He could see it at a glance when told, but it had never occurred to him to think that a chemist might be useful in manufacturing anything. He knew about analytical chemists, but nothing beyond that.

It is common knowledge that no work in the world is done cheaper than commercial analysis, and few firms expect to pay for what might be called chemical suggestions. A man will pay five dollars to know that a witness of a will cannot benefit by the contents of the instrument, or forty dollars to know that the title to a five thousand dollar house is clear, and a fair fee for keeping him under an anaesthetic., but the same man expects to have an accurate analysis made of something or anything for fifty cents. His sense of values needs adjusting. A chartered accountant comes in to examine the books at a very fair rate of pay, but a consulting chemist is expected to set the plant in order as a measure of good will. Manufacturers fail to consult with chemists because they do not understand the kind of service a chemist can render.

The general situation among consulting chemists is such that well trained men are not attracted to the work in large numbers, and the conditions are made worse by the introduction of inexperienced amateurs, who will attempt anything for a slave's pittance. Their mistakes ruin the faith of manufacturers.

The whole situation needs clearing up. There are many plants unable to support a good chemist, but they need the constant direction of a qualified man. The brains are not brought together with the opportunity because of the undeveloped organization which chemists have to begin with, and their utter disregard for legitimate publicity. We believe the fault lies more with chemists than with manufacturers, because we see daily examples of industries being sold something which they never knew they wanted before. If this is true in part, chemists should arise to the opportunity and become real salesmen, and backed up by their own organization, go into the field confident that their services are of value and needed. The laboratory is the last place in the world to develop salesmanship, and chemists appear to be batting as the worst team in the league of business professions simply because they do not, or will not stick together and sell chemistry.

IN A NUTSHELL.

We can't add much to this as an epitome of cause and effect:

The night cashier overheard a peculiar conversation in Beaver Crossing the other day. A farmer was in a store buying some groceries.

"Want any flour?" asked the grocer.

"No, flour's too high, I can git along without it."

After a while the grocer said: "Sold your wheat, Bill?"

"Nope, I'm goin', to hang onto mine; they ain't payin' nothin' for it yet."—"Vancouver Province."

GULLS.

HOUR after hour you've seen them gracefully plodding astern. The child throws a piece of bread—a gull banks and nose dives—again, the child's stock of edibles is gone, but he crumples up a piece of paper and throws it out. Down goes the gull, but not all the way—even a gull cannot be fooled entirely.

There are men otherwise well-balanced who can't get away from the idea that success depends in some great measure upon the purchase of some process, regardless of the well established fact that experience and business commonsense have been the foundation of most, if not all, great businesses.

Why, for example, should business men consider it necessary to pay large sums for rights in the manufacture of fuel briquettes? All that is of practical value in the making of fuel briquettes is common property, as in any other line of technology.

The favorite vehicle for the process fraud is the name of the country wherein pioneer work was done. Often, in fact, any country will do, except one's own. The Netherlands have cradeled many industries; therefore "Dutch" is a good open sesame to the funds of the small investor. It would perhaps be too much to expect any regulation to cover these cases. We would, however, issue a warning that "Old Dutch" or "Original Japanese" or other geographical processes have probably been superseded or improved upon, even at home, by modern methods, and that what might be successful in Patagonia or Pernambuco would not necessarily prove a fortune maker in Canada. Canadian chemists and engineers can devise ways and means of making anything of practical utility on equal terms with the technologists of any other country.

DR. HERTY'S NEW UNDERTAKING.

DR. CHAS. H. HERTY has resigned the editorship of "The Journal of Industrial & Engineering Chemistry." He is succeeded by Mr. Harrison E. Howe. The passing of Dr. Herty from this position will be regretted by American and Canadian chemists alike. Without doubt Dr. Herty won the hearts of Canadian chemists during his visits to Canada in a way which has not been exceeded by any other American. We might even say has not been approached. His successor comes with a broad experience. He too knows Canada through his connection with the Arthur D. Little Company, having been in charge of their Montreal office. He

is also a graduate of the Universities of Michigan and Rochester. In the field of popularization of science the new editor is well known.

Dr. Herty is embarking on a new undertaking as president of the Synthetic Organic Chemical Manufacturers' Association of the United States. No doubt, he feels that under the present conditions the dyestuff industry of America needs his leadership and support. In this we join with him. Dr. Herty never sidestepped a struggle when he felt he was right, and some day America may point with pride to those who kept her on the right track, safeguarding her best interests when they needed the most support. We wish Dr. Herty well, and his successor the entire co-operation of the great American Chemical Society. Our attitude is that we have not lost Dr. Herty, but we have gained Mr. Howe.

COMPLETING THE ORGANIZATION.

THE Society of Chemical Industry received a new impetus from the Annual Meeting of August last. This has been indicated by the enthusiastic meetings held at local centres by branches, and we believe that a fine season and future is ahead of this organization here.

There is one cog missing, or rather not yet placed where it belongs. We refer to the overhead council for Canada, which was to consist of local chairmen and secretaries and a chairman and secretary for Canada. This would complete the organization, and give the local branches some overhead control.

If the Society is to prosper properly here, it will require a permanent paid secretary, whose business it will be to keep the local branches working and growing all the time. This may not be possible immediately but it should be kept in mind and undertaken just as early as funds are available. There are many things the Society can do, which have a Canadian application, and which may not be of interest to the Society as a whole. Something should certainly be done to complete the original plans which were made so necessary, following the establishment of distinct branches and the breaking-up of the original Canadian section.

CONDITION OF SCIENCE IN RUSSIA.

A RECENT letter received by a member of the Canadian Institute of Chemistry from a Russian professor of chemistry, gives some idea of the situation as far as the degredation of science in that country is concerned.

"My last letter contained some particulars as to how we were being fed. Since that time all has changed much for the worse. We receive now almost nothing. From the 1st of June (1921) our bread rations will be discontinued, the little bread left goes only to the army. I have worked almost daily during the last two weeks spading and hoeing a bit of land which was not cultivated for many years and the work was terribly hard. All our professors have done the same, working as I did off and on during the time not occupied by academic duties. We still carry on the latter as best we may without scientific literatures and consequently ignorant of the progress made during the last four years in foreign and more favored countries; using in the laboratories the remains of re-agents which we obtained mostly before the war. Even writing paper is unobtainable, official documents being written on the blank side of old documents. We have lost all sense of pride and thankfully accept alms."

A most unhappy picture which should inspire in us a better sense of appreciation of the significance of our national stability.

THE NAME "CHEMIST."

Editor Canadian Chemistry and Metallurgy:

Dear Sir,—Commenting upon an editorial which appeared recently in your paper, in reference to the question of the name "Chemist," I quite agree with you that within recent years a good deal of confusion has arisen with regard to the use of this name as applied to the "chemist and druggist," to the analytical chemist and to the technical and industrial chemist. Of late years the technical chemist has attained a position which calls for a clearer definition of his exact standing. Certainly, the appellation "chemist" is too loose to define exactly what he is, unless others who can lay claim to it are willing to surrender the use of the word.

When the "chemist and druggist" is sometimes mentioned, as I have heard him referred to, in slighting terms, as having no claim to the title "chemist," I should like to say that he has more right to the use of the word than anybody else, because in the early fifties of the last century he received this title by Act of Parliament and enjoyed it for many years, long before the technical chemist as we know him to-day, was thought of. Furthermore, the ranks of the "chemist and druggist" so-called, have contributed in not a small measure to the ranks of some of our leading chemists, who have specialized in some direction or other from the ranks of the pharmacist.

Should the chemist and druggist be approached with the object of getting him to surrender the term "chemist," I would suggest that it be done in the most diplomatic way, as undoubtedly he is entitled to that distinctive term so far as the public is concerned.

I would suggest that the matter could be easily adjusted if the chemist and druggist could be persuaded to adopt a more correctly distinctive title, namely, that of "pharmacist," discarding both terms of "chemist and druggist." Such a surrender on their part would only be a partial solution of the problem, for the simple reason that with the development of science the term technical chemist is subject to considerable sub-division, and now we are becoming familiar with the "chemical engineer" or the "engineer chemist." That side of the question, however, can be left to the technical chemist to work out if the "chemist and druggist" is prepared to accept the far more accurate and distinctive title of "pharmacist," leaving the title "chemist" to the academic and industrial chemist for their use.

Canada has led in many ways, and perhaps it would be rather a good thing if the Canadian "pharmacists" and the Canadian technical chemists could get together and agree upon such a division of titles.

Yours truly,

THEO. H. WARDLEWORTH.

Montreal, October 31st, 1921.

CANADIAN PRODUCTION OF IRON AND STEEL.

Nine Months Ending September, 1921.

The total output of pig iron in Canada during the nine months ending September, 1921, amounted to 457,157 tons, or slightly over 63 per cent. of the amount produced during the same period in 1920. The production for the half year amounted to 69 per cent. of the total for the same period in 1920.

The autumn months have been very quiet in the iron trade, but there has been a gradual improvement in the steel industry of the United States during the past two months, and as the trend of Canadian output parallels that of the United States, it is probable that a gradual improvement will be noted during December and January.

Ferro-alloys produced during the month of September amounted to a total of 914 tons, all of which was ferro-silicon made in electric furnaces and produced by makers for direct sale. The production of ferro-silicon during September was therefore about 50 tons less than during the preceding month, and, owing to the fact that no spiegeleisen was made, in September, the total production of ferro-alloys shows a very marked decrease from the August figures. There was no change in September of the number of furnaces in blast. There were, therefore, five furnaces operating at the end of the month, namely, two at Sault Ste. Marie, one at Hamilton and two at Sydney. This left fifteen furnaces idle throughout the month.

Steel Ingots and Castings.

The total output of steel ingots and castings for the nine months ending September amounted to 477,588 long tons, as compared with 845,000 tons during the first three-quarters of 1920. The output for this year is, therefore, equal to about 57 per cent. of the quantity made in the same time last year.

During the nine months the output of steel ingots totalled 459,960 long tons, while steel castings amounted to 17,628 long tons. Makers produced for their own consumption 459,249 long tons of steel ingots, of which 457,-350 tons was basic open hearth steel, the balance being electric, acid open hearth or bessemer product. During the same time, 3,423 tons of castings was made and used, while a total of 14,205 tons of direct steel castings was produced for sale. Of this latter amount, 10,890 tons was made in electric furnaces, the balance being made by basic open hearth, bessemer or acid open hearth process.

October Production.

The upward trend noticeable in so many lines towards the latter part of October was reflected in the output of pig iron for the month, the total being almost 6,000 tons higher than the amount reported from the Mining Branch of the Dominion Bureau of Statistics as the output for the preceding month. Basic pig iron made in blast furnaces and produced for the use of the makers amounted to 41,846 tons in October, as compared with 38,590 tons in September. Basic iron made for sale rose 100 tons to 510 tons, making a total output for the month of 42,356 long tons. A total of 87 tons of foundry iron was made for further use, while 7,130 tons was produced for sale. This latter figure is 50 per cent. higher than the corresponding figure for the previous month. No malleable iron or direct-iron castings were made in October, so that the pig iron produced by makers for their own use amounted to 41,933 long tons; that for sale was 7,640 long tons, which makes a total output for the month of 49,573 tons. The average monthly output of pig iron this year to date remains unchanged at 51,000 long tons.

Ferro-alloys showed a similar healthy increase, the output for the month being 1,266 long tons, as compared with 914 long tons in September. This product was, as usual, all ferro-silicon in grades of 15, 50 and 75 per cent. The output of ferro-silicon in October was higher than for any month since February last when a total of 1,662 tons was made. This comparison does not hold for the total output of ferro-alloys, since it is the custom to include under this heading any spiegeleisen that is produced, as well as the ferro-silicon. No spiegeleisen has been made since August.

There was no change during the month in the number of furnaces operated. The five in blast at the beginning of the month continuing active throughout and being still in operation at the close of the month. These five included two at Sault Ste. Marie, one at Hamilton and two at Sydney.

Steel Ingots and Castings.

The output of steel and castings for the month of October established a new high record for the year at 72,204 long tons, an increase of nearly 16,000 long tons over the production during the preceding month, and some 200 tons more than the output for August, when the previous high record for the year was made. During the latter part of the month, particularly, there was a favorable turn in the steel-making industry closely following the increased production in the United States at the same time. As noted in the preceding record, the output of pig iron recovered to the August level, and in the production of steel ingots and castings the output also rose to the August mark and passed slightly beyond.

COULD AMMONIUM PERCHLORATE BE MADE HERE?

The prime requirement is cheap electric power. The raw materials are salt, some bichromate, a little Hcl and some ammonia. The United States imported $349,930, or 1,729 tons, in 1920. It has a limited use in pyrotechnics, is a good oxidizer, but its chief possibilities seem to lie in the manufacture of explosives.

American Association of Chemical Plant Manufacturers.

The organization of this new association of Chemical plant manufacturers unites the leading business compaies for the general promotion of their best interests

J. George Lehman, of Bethlehem Foundry and Machine Co., is Chairman. Members of Committee are: Paul O. Abbe, of Paul O. Abbe, Inc.; A. A. Holmes, of E. B. Badger & Son; Dr. C. H. Kimberly, of Schutte & Koerting Co; and P. C. Kingsbury, of General Ceramics Co.

SOCIETY CALENDAR.

American Association for the advancement of Science—74th Annual meeting, Toronto, University of Toronto, December 27-31, 1921. Secretary, Burton E. Livingston, Smithsonian Institution, Washington, D.C., U.S.A.

American Good Roads Congress, Coliseum, Chicago, Ill., January 17-20, 1922.

Anti-Corrosive Chemical Engineering Plant

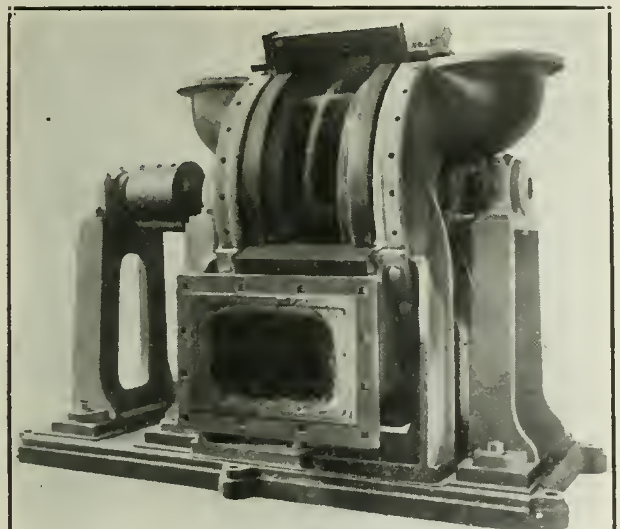
Some English Chemical Equipment Designed for Special Service in Handling Acids and Corroding Liquids

AN increasing number of industries utilize corrosive liquids in course of their manufactures. In this connection there is very wide scope for new plant even for the fundamental operations. To obtain works efficiency it is essential to control the physical conditions as completely as possible and particularly in the case where corrosive chemicals are used to construct plant on such systems as will avoid contamination of the chemicals and materials by the plant or corrosion of the plant and its serious deterioration.

The fulfilment of these conditions results frequently in considerable labour saving effects.

One striking case in the experience of Guthrie & Co., Chemical Engineers, Accrington, England, only during the last few months of the application of some of their plant resulted in the possible saving of 60 to 80 men and consequent reduction in the price of the product.

It was these considerations that during the last few years led this firm to manufacture the ceratherm centrifugal pumps for any liquids in any condition and the ceramic lined vats with undetachable and unattackable linings.



Armored Ceratherm Fan or Exhauster for Acid Gases.

The ceratherm centrifugal pump has been specifically designed to handle any corrosive liquid, whatever head or quantity may be required or whatever liquid may be used. The material which has been selected for the pump is a form of ceratherm. Ceratherm is a new acid ware which was prepared during the war for rapid condensation of large quantities of acid gas in the manufacture of explosives. It resists chemicals like porcelain and its manufacture is similar. Small articles may be heated to a red heat and plunged into cold water without cracking, and it conducts heat much more rapidly than ordinary stoneware thus enabling an equable temperature to be maintained throughout any apparatus into which it is made.

For the manufacture of pumps a particularly tough form was prepared, which while retaining sufficient of the heat proof properties also presented advantages in being highly resistant to shock and being suitable for the manufacture of machinery. From this material are cast exceedingly thick and strong pump casings. These are set into iron armouries by means of cement which possesses remarkable acid resisting properties. The inlet and outlet of the pump are so constructed that coupling up can be accomplished without any fear of damaging the pump, and the ceratherm is only subjected to crushing strain to which it has considerable resistance.

The liquid is fed in to the pump on the gland side, which is always under suction, and the pumps in operating hold their own gland in position, tightening up here being quite unnecessary. The manufacture of the impellers has been a very interesting problem. Methods have been designed for fastening the impeller to a steel shaft in such a manner that the severest strain will not cause detachment. Considerable research work was spent in devising an impeller of such form that it should be self balancing, and should be capable of pumping a wide variety as regards quantity and as regards head. For particularly rough work on such acids as hydrochloric or sulphurous even the disc portions of the impeller have inserted within them steel blades although no external part of the impeller is metallic. The design also obviates thrust entirely and is suitable for any liquid which is capable of being pumped.

A few readings of pumps which have actually been in operation in various works are appended here, which will indicate the satisfactory efficiencies obtained with pumps of this description, which have the overwhelming advantage of being indifferent to liquids.

The final result is that a pump which has been constructed of porcelain-like material, yet has the mechanical strength which in favourable conditions of its operation will compare with the strength of any metal pump. The highest head which has been attained in a single stage by means of these pumps is 300 feet. The quantity varies in the standard types supplied from 20-500 gallons per minute.

Pumps are actually in use pumping hot hydrochloric followed by cold alkali, nitric acid of all concentrations, sulphuric acid, acetic acid, solutions of copper salts, sulphuric acid for paper manufacturers, liquids containing chlorine, bromine, copper chlorids and even aqua regia.

A FEW ACTUAL READINGS

1750	revs.	55	lbs.	press.	160	gals.	per minute	12¾	H.P.		
1200	"	25	"	"	60	"	"	3¾	"		
1000	"	15	"	"	160	"	"	2¼	"		
1800	"	50	"	"	160	"	"	15¾	"		
1600	"	40	"	"	120	"	"	8¾	"		
1300	"	25	"	"	120	"	"	3¾	"		
1600	"	45	"	"	75	"	"	8	"		
1400	"	35	"	"	110	"	"	5¼	"		
1685	"	50	"	"	120	"	"	11¾	"		
1750	"	55	"	"	120	"	"	12	"		
1500	"	21	"	"	400	"	"	11.8	"	Efficiency	51%
1500	"	30	"	"	350	"	"	13.4	"	"	55%
1500	"	23	"	"	410	"	"	11	"	"	49%
1500	"	21	"	"	360	"	"	11.75	"	"	48%
		25	"	"	280	"	"	10	"	"	50%

Head & Pipe Friction feet.	Press. lbs.	Quantity per min.	Appr. H.P.	Speed.	Appr. Efficiency.
64	25	326	12	1320	50%
64	25	300	11.5	1320	50%
50	19.5	420	14.5	1320	50%
68	26	400	18	1425	50%
80	31.5	300	14.5	1425	50%

Chlorinert Ceramic Lined Vats.

Quite a number of chemical operations require re-action vessels which will not interfere with the chemical change. The most inert tank which has yet been constructed for this purpose is the chlorinert ceramic lined tank, which is illustrated in the photograph shown here. This may be lined with either porcelain or ceratherm. Porcelain or ceratherm, (which is heat proof) tiles are sealed to iron or steel vats giving a one piece effect. The sealing material is not affected by boiling acids, such as boiling hydrochloric and is of extremely high tensile strength.

The result is a vat with a lining, which may be of any desired thickness, which in practice cannot be detached by the severest mechanical or chemical strain from the side and which is capable of being kept perfectly clean. Expansion and contraction by heat do not affect this system. These vats are often sent very long railway journeys without any ill effects to the lining and are quite suitable for making acid tank cars. They have a very wide application for the manufacture of substances like collodion and for paper digestors. In the case of paper digestors this lining is at least a thousand times as resistant as any lining which has hitherto been provided to the chemicals contained and need only be one-sixth the thickness of the old fashioned lining which is still frequently in use. This means a better output from the same size of vessel.

The manufacture of foodstuffs using hydrochloric acid under pressure has been carried out successfully for some years in these vessels. This is a supreme test as every chemist will at once realize that the results obtained must have been very pure, the sense of taste being one of the sharpest of analysts.

A Porcelain Lining, which Cannot be Detached from Steel or Iron Vessels.

In the article dealing with Electrical Systems following this article an illustration is shown of a ceramic lined vat coupled up to an armoured ceratherm centrifugal pump.

From Chemical Engineering Department,
Guthrie & Co., Accrington, England.

NEW ELECTRICAL SYSTEMS OF HEATING LIQUID AND SOLID CHEMICALS.

Chemical Drying and Evaporating Equipment Designed to Operate Most Economically Where Electric Power Costs are Low.

The recent apparatus devised by Guthrie & Co., Accrington, has for its object a simple method of electrically raising the liquid in question to any desired temperature. The liquid is made to flow down a suitable cascade or step ladder, and the length and area of cross section of the liquid, under the influence of the electrical current which is passed through the liquid itself, is under control. The result is that the resistance of the liquid is also controlled, and therefore the amount of heat generated, by means of a suitable alternating current which obviates the products of electrolysis. By causing the liquid to pass over a variable number of shelves multiple heating effects to any desired degree may be obtained. The heating effects are very rapid, and the liquid cannot be heated to a higher temperature than it is desirable that it should be exposed to. Control of the electric current and speed of flow automatically give control of the temperature. In any case the liquid can never come in contact with any surface at a temperature higher than that of the liquid itself; nor can the liquid be heated above its boiling point.

Cascade Electrical Heater.

By means of a ceratherm pump and by constructing the step ladder or cascade electrical heater of suitable material such as graphite any corrosive liquid may be handled and may be pumped round as many times as may be required. Alternatively the liquid may be allowed to flow from one vat to another and the electrical heater is of sufficient power to give the necessary temperature change in a single operation. Suitable arrangements of the shelves may be made either for single phase or three phase current as desired. The advantage of doing away with surfaces of transmission of heat, which are always a source of trouble when corrosive liquids are concerned, and when the liquid has not to be exposed to a higher temperature

System of re-action and heating highly corrosive chemicals, using STEP LADDER ELECTRICAL HEATER. H.L. Chlorinert Ceramic Lined Vat. Armored Ceratherm Centrifugal Pump, Armored Earthenware Pipes, Electrical Heater constructed of inert materials such as carbon. Instantaneous heating of chemical liquids.

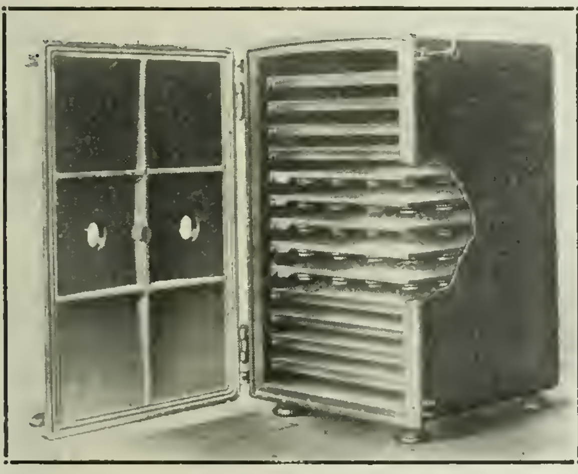
than the final temperature to which it is desired to take it, which is always the case if the surface of transmission of heat is in contact with a source of heat at a higher temperature, is attractive; and one of the most awkward things to construct, namely a rapid chemical heater for any liquid under perfect control without surface troubles is now available to the chemical trade.

In the illustrations accompanying this article, the piping, vats and pump indicated may be all non-corrosive. For example the vat may be ceramic lined, resisting boiling hydrochloric, the Ceratherm pump would not be affected by any acid and the piping would be armoured porcelain.

Such a system has its advantages in the manufacture of certain fast dyes. In the handling of certain starches also there are considerable advantages, because by using a coil in the ordinary way the temperature of the coil which is higher than the liquid is liable to cause the bursting of the starch sacks, and consequent heavy loss. This is entirely obviated by means of the heater here described.

The efficiency of the system tends naturally to approach the theoretical efficiency of 100 per cent. owing to the fact that practically the whole of the energy in the current is utilized in the generation of heat.

The cost to raise the liquid from atmospheric temperature to boiling point is something in the neighbourhood of 0.5 times the cost of electricity per unit of 1000 watt hours and therefore will vary between about 0.05d. and ½d. or ¾d. a gallon according to the circumstances and character of the process and supply of electricity.



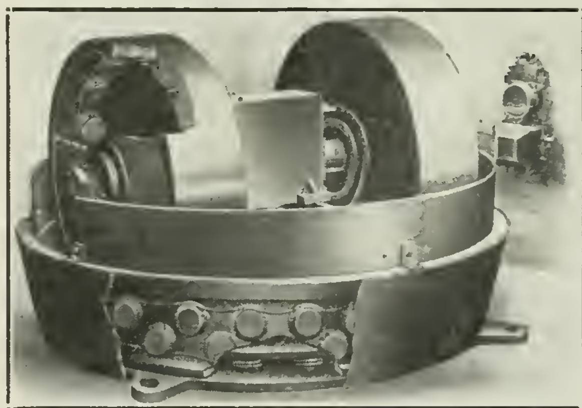
Induction Surface Electric Heater Applied to Drying Ovens.

The simplicity of the apparatus tends to cause wear and tear to go out of the equation and there are further advantages in the adaptability of the scheme which may be applied in almost any position. All that is necessary is to carry a cable to it.

Interesting possibilities in connection with the concentration of chemicals and acids arise in connection with this electrical heater. Take for example a Kessler, for comparative purposes. Suppose we are producing 95% acid from 65% acid. In the case of an electrical heater very high efficiencies may be expected. Electricity in one case under our notice costs 0.186d. per unit, and on a plant producing 10 tons per day of finished product the cost of electricity would be about £5-12-0 per day. In the same locality the cost of coke is between £2-10-0 and £3-0-0 per day for the same output. Allowing for labour, maintenance and depreciation, however, and less initial cost, the electrical system runs the Kessler even in those conditions very closely, and where as in some cases electricity is available at 0.1d. per unit the electrical system is sometimes considerably cheaper than the Kessler. Where coke is more expensive the comparison favours electrical methods on all points.

In view of the large developments of water power in Canada and the wide applicability of the electrical system the possibilities opened up in the direction of evaporation are extremely interesting.

Another interesting application of a novel electrical system for the chemical trade and those trades using chemicals is the induction surface heating system for the electrical drying and heating of solid chemicals. The aim of this apparatus is to generate the necessary heat for drying of chemicals or for maintaining them at the temperature at which it is desired they should be kept within the body of the substance on which the chemicals are placed. By placing a coil carrying alternating current in suitable relation to this surface, the induced current and hysteresis effect generate the necessary amount of heat, and the control of the primary results in perfect control of the temperature. This heat can be applied to surfaces in drying and other machines which are ordinarily difficult of access, and the apparatus avoids the necessity



Induction Surface Electrical Heater Applied to Grinding.

of constructing pressure chambers or jackets which both cheapens and simplifies the constructing of drying machines. The heat is made available very rapidly and at the exact spot where it is required, thus preventing waste. The apparatus may be in any situation—all that is necessary is to carry the cable to it. Both rotary or drum dryers and shelf dryers whether vacuum or otherwise, may be much improved by the use of this system, which can be applied to most machinery without serious modification of the principles of its design, but on the contrary the result is often to simplify the use and design of existing types.

In the illustration is shown a case where it is desirable to maintain a substance at a comparatively high temperature whilst it is being ground.

Economical working for evaporation by this system in the case of dryers depends of course on cheap electricity. In many cases the economies effected make it worth while installing where electricity is at prices such as obtained in England.

The formula for cost would be:—Cost to evaporate 10 lbs. of water equals 3.3 multiplied by efficiency multiplied by cost per kilo watt hour.

In one case under the writer's notice very large grinding pans weighing about 17½ tons each were necessary for grinding certain substances hot, if steam jackets were used. The weights when the electrical heaters were used is reducible by about three tons per set and cost proportionate, while the results obtained are superior.

Valuable applications are also obtained in connection with pumping sticky or very viscous liquids, which have to be maintained at a relatively high temperature in order to keep them in the form which is easy to pump. This is easily accomplished without the use of steam jackets on the pump, by making the sides of the pump suitable for the application of the induction surface heater. In that case the pump itself is maintained at the temperature desired and the substance within is not cooled in such a way as to be liable to choke the pump. Similar remarks apply to pipes which it is desired to maintain at a high temperature, which may be accomplished without the use of steam jackets. Such trades as the chocolate trade offer interesting application of these methods of procedure. Where it is convenient to obtain high frequencies of course very considerable temperatures may, if desired, be reached.

Additional useful application for rollers for paper making and textile purposes have been developed from the Induction Surface Heater which makes it possible to maintain rollers at any desired temperature most accurately even when subject to variable rates of cooling.

The systems are subjects of patents pending in the chief industrial countries.

Engineering Department,
Guthrie & Co., Accrington, England.

WHAT IS PAPER?

Below is given a table giving the exact amount of each of the various materials that goes into, or are used in the making of one hundred pounds of paper. The table is taken from "Paper" (New York) and originally appeared in "The Mill," the house organ of the Eastern Manufacturing Company:

Wood	13.4 cu. ft.
Sulphur	12.7 lb.
Limestone	17.5 lb.
Kerosene	5.7 oz.
Bleach powder	14.3 lb.
Rosin	3 lb.
Soda	.515 lb.
Alum	4.2 lb.
Color	1.8 oz.
Coal	320 lb.
Iron sulphate	.79 oz.
Copper sulphate	.19 oz.
Lime	3.17 oz.
Belt	2 sq. in.
Felts	32 sq. in.
Wire	67 cu. cm.
Lubricating oil	220 cu. cm.
Water, chemically purified and filtered	7,500 gals.

WORLD POTASH SUPPLY.

The following summary of the world's potash (K_2O) supply was given by Mr. H. A. Huston, Director of German Kali Works, New York, before the fertilizer section of the American Chemical Society in New York City.

World's Potash Supply.

Ranks of countries on basis of potash sources	Comparative quantities in sources
Germany	6,000
France	10
United States	1

The above figures show that Germany has 6,000 times, and France 10 times, the quantity of the known potash supply in the United States.

Capacity for Annual Production.

	Tons
Germany	3,850,000
France	250,000
United States	80,000

Probable Quantity in Each Source.

	Tons
Germany	180,000,000,000 above 5,000-foot level.
France	300,000,000
United States	30,000,000

The annual potash requirement of the United States is approximately 372,000 tons.

It looks as though the world need not fear a shortage of potash for many years to come.

CANADIAN "METHYL HYDRATE" REGULATION.

The following extracts are not as well known as they might be, and are again printed for the benefit of the trade.

Extracts of Act to Amend Inland Revenue Act, assented to July 1st, 1920, Chapter 52.

Sub-section 2 of Section 266.

"Every person who uses methyl alcohol or spirits containing methyl alcohol in any form, in any pharmaceutical, medicinal or other preparation, intended for external use, shall affix to the vessel containing the said preparation a label bearing the words, 'Methyl Hydrate-Poison,' in black letters not less than one-fourth of an inch in height, indicating the presence of methyl alcohol therein; and every person violating the provisions of this sub-section shall incur a penalty not less than fifty dollars and not exceeding two hundred dollars."

Section 373 (1)—

"All vessels, the capacity of which is one gallon or less, when containing wood alcohol or denatured alcohol, whether in the possession of the manufacturer or other person, shall have affixed thereto a label bearing the words 'Methyl Hydrate-Poison' in black letters on white ground not less than one-fourth of an inch in height. If the capacity of the package exceeds one gallon, a label shall be affixed thereto bearing the inscription heretofore defined in black letters on a white ground not less than one-half of an inch in height.

"(2) Except as herein otherwise provided, any person who holds in possession, sells, exchanges or delivers any alcohol or specially denatured alcohol contrary to the provisions of this part shall be liable upon summary conviction to a penalty of not less than two hundred dollars and not exceeding five hundred dollars."

NEW DYE MANUFACTURING COMPANY.

The Winchester Dye Company, Ltd., has been organized at Toronto, to manufacture aniline colors and intermediates. They have secured the property of the Staynon Rubber Co., at New Toronto, and expect to be manufacturing by the end of January.

This company is affiliated with the Gunnash Chemical Works of Newark, N.J.

The company is organized with an Ontario charter, and capital stock of $100,000. Those directing operations are T. O. Scott, E. C. Codling and W. W. Young.

Modern Developments in the British Brass Industry*

By Ernest A. Smith,† A.R.S.M., M.Inst.M.M.

A CHARACTERISTIC feature of modern industry is the preponderating part which scientific knowledge and methods play in its development. It is being increasingly recognized that one of the greatest factors in progress of any branch of industrial activity is the extent to which scientific and technical knowledge is practically applied. This being so it is not too much to assert that the vigor and progressive spirit of an entire industry may well be gauged by the activity and growth of the individual firms engaged in it, and that this will depend in no small measure on the extent to which the individual firms avail themselves of the scientific and technical knowledge relative to their industry which modern research has placed at their disposal.

The very exceptional claims made upon manufacturers during the war period caused them to seek the aid of scientific knowledge and guidance to an unprecedented extent, and led to developments that would have taken much longer to accomplish under normal industrial conditions.

In few cases has such development been more pronounced than in the brass industry. Time-honored practices based largely on empirical knowledge, have been subjected to the closest scrutiny and modified or discarded where found to be incapable of meeting the demands of modern industry. Viewing the industry as a whole one cannot fail to recognize a great step forward towards greater efficiency in plant and improved quality of product. Signs are not wanting that the British brass industry is now entering upon a new era in its long history.

The conditions of modern works practice necessitate a large amount of scientific control, not only of raw materials, intermediate products, and finished output, but also of methods and appliances used. This fundamental factor enjoys to-day greater recognition and fuller appreciation than ever before, but in spite of the considerable progress that has been made it must be admitted that not a few manufacturers still regard science and research as things belonging essentially to test-tubes and laboratory experiments, and remotely removed from everyday works practice.

For an industry, so long established and so largely built up on empirical knowledge, such as the brass industry, to reconstruct itself on a scientific basis is, however, no light task, but all impartial observers are agreed that this change which began some ten years ago is now proceeding at an accelerated rate.

The rapid progress that has been made in non-ferrous metallurgical research during the past few decades has placed at the disposal of manufacturers a considerable amount of new information relative to the materials employed in industrial art. Research has afforded a much deeper knowledge of the structure of metals and alloys, and a better understanding of the phenomena which are met in connection with their use in industrial practice.

A comparatively large proportion of this research has been devoted to brass and kindred alloys. While it must be admitted that some of this knowledge is of doubtful practical utility, and in some cases even misleading, there still remains a considerable amount of reliable knowledge that is of the greatest value and practical importance, when placed in the hands of a trained staff capable of utilizing it intelligently.

An example of a great benefit to the brass industry derived from research is the electrolytic production of high-grade copper and zinc, both of which have done much to improve the quality of brass products in modern times.

It would appear to be necessary to urge upon scientific contributors to brass literature to give to the manufacturers much fuller information than is usually done on the history of the materials used in their researches. For example, one comes across many papers in which figures are given for alloys of various tensile strength, yield point, elastic limit, elongation, reduction in area, etc., but in how very few cases is there a really adequate history of the material tested. We frequently have reports for instance on rolled brass in which no mention is made of the degree of cold work that has been put upon it, or what, if any, heat treatment has been given. The brass industry in particular suffers from this lack of essential information.

It is the purpose of this paper to indicate briefly the extent to which existing scientific and technical knowledge has been utilized in the British brass industry as a whole, and to describe the development that has resulted from its utilization.

Works Laboratories.

Undoubtedly, in the past, one of the obstacles to the introduction of scientific methods has been the lack of works laboratories, which would serve not merely the purposes of analytical control, but also act as channels through which new knowledge could find its way into the works. As an intelligence department the laboratory is invaluable, but to fulfill its purposes fully it should be constantly on the look-out not only for new scientific knowledge, but also for improvements in technical details of production.

The demand for ever increasing efficiency in the founding and manufacture of brass has led to the introduction of methods of determining the qualities of the materials used to a much greater extent than was formerly considered to be necessary. Not only is it absolutely essential to have an accurate knowledge of the composition of the metals used for alloying purposes, but also to make careful physical tests of the metal during the various stages of manufacture. It is also considered highly advisable to test most of the other raw materials used in the foundry and in other departments of the works. Although much has been done in this direction there is still room for an extension of the system of putting the casting shop under the direct control of the laboratory, with an attempt to secure the most complete co-ordination.

The lack of laboratories is chiefly accounted for by the fact that in the brass industry as in other non-ferrous metals industries, there are comparatively few firms sufficiently large or wealthy to equip and maintain efficient up-to-date laboratories such as one finds in the steel industry. Groups of firms in association have established laboratories with suitable equipment, so as to be in a

*Paper presented at Fortieth General Meeting of American Electrochemical Society, October 1st, 1921. Manuscript received by Society, August 31st, 1921.
†British Non-ferrous Metals Research Assoc., Birmingham, England.

position to exercise more exact control of materials used, as well as of quality of products manufactured.

The first co-operative laboratory started in Birmingham in 1916 took the form of a small company, registered under the Board of Trade, and limited by guarantee. The equipment consists of a complete chemical laboratory fitted with every necessary appliance, together with a metallographic laboratory and appliances for physical testing and for pyromteric work. With such equipment many of the minor problems that present themselves in every-day works practice can be investigated and assistance given to the individual firm in whose works the difficulty arose.

Melting and Foundry Practice, Coke and Gas Fired Furnaces.

Manufacturers are today more fully appreciating the fundamental importance of a sound ingot as the primary step to the successful and economic manipulation of the material in subsequent operations.

As H. B. Weeks has so well pointed out[1] "the architectural designs of a workshop have much more to do with its efficiency than is generally supposed. Particularly does this apply to foundries where fumes, smoke, and dust are continuously mingling with the atmosphere in which the moulders have to work. It is on that account, therefore, essential that spacious, well-lighted, well-ventilated, and lofty buildings should be erected for foundry purposes."

Many old brass foundries have been altered and remodelled as far as possible on modern lines, and newly erected foundries have been carefully planned with due consideration to the various factors mentioned. But much yet remains to be done to bring the foundries and melting shops of the brass industry as a whole to that state of efficiency in design and equipment, which is so essential to its future well being and progress. The substitution of up-to-date appliances for old, and the extension of labor saving devices are important factors in improved foundry production, and these factors are not being lost sight of where economic conditions are favorable to their adoption.

The furnace being of primary importance in foundry work has received a considerable amount of attention during the past decade. The old simple form of square coke-fired crucible furnace, almost universally in use at the beginning of the present century, has now been largely replaced either by improved types of coke-fired furnaces or by gas-heated furnaces. Whilst gas furnaces offer several important advantages over coke furnaces, and are being employed in increasing numbers for melting brass, it cannot truly be said that they are fully established for brass melting generally. The modified coke fired crucible furnace is still the most generally employed for melting brass and other copper alloys.

The ordinary type of pit coke fired crucible furnace has however been much improved and made more efficient by alterations in design, chiefly in the introduction of new forms of bottoms which permit of a more satisfactory supply and distribution of the air, which in some cases is preheated. A number of fire clay furnace bottoms have been patented, such as the Wigley, Edgar Allen, Hall, etc. A number of furnaces with bottoms of this type are in use, and are found to be much more economical and efficient and a great improvement over the old pattern furnace bottoms. Attention has also been given to the construction of the furnace lining and the quality of the material of which it is made. Another form of furnace in fairly general use is Carr's patent furnace, in which provision is made for retaining the heat by inserting non-conducting material in the furnace lining; special facilities are also made for a good supply of air, and for cleaning. At the brass foundry of Messrs. Vickers, Ltd., Barrow-in-Furness, there are forty-four crucible furnaces of a modified Carr type, which are stated to have contributed in no small measure to the success of the foundry work. Plumbago crucibles of 300, 200 and 150 lb. holding capacity are used.

With regard to gas fired crucible furnaces these have been applied to certain classes of brass melting in many localities where coal gas can be obtained for heating purposes at a reasonably low rate. Many types of gas furnaces having crucible capacities from 50 lb. to 800 lb. have been introduced for brass melting, and may conveniently be divided into two main classes according to the manner in which the gas is applied, viz.: low pressure furnaces and high pressure furnaces.

The low pressure type of furnace usually consists of pit furnaces and tilting furnaces with a crucible capacity of from 60 to 800 lb. which are employed for melting all classes of brass for the production of castings, ingots, billets, and strip for melting scrap and swarf.

The high pressure type consists of pit furnace with a crucible, capacity varying from 60 to 200 lb. for melting brasses for strip and billets and for sand castings.

For this class of work furnaces fitted with atmospheric injector burners are generally used except where high speed of melting is required. Where gas furnaces have been introduced for brass melting they are chiefly of the low pressure type, as in the majority of operations there is no need to use high pressure gas.

In Birmingham the centre of the British brass industry the Corporation has twenty miles of high pressure gas main laid and several brass founders in the city have adopted high pressure gas furnaces. A serious objection to all gas furnaces working under pressure is the noise, which is very trying to the melters and tends to militate against efficient production.

The author is in agreement with S. W. Brayshaw and others in considering that the future of gas melting furnaces lies not in high pressure gas, nor even with gas from the main, and air at 1 or 2 lb. pressure, but with ordinary gas and air at only a few inches of pressure not exceeding a 12-inch water column. This would mean an enormous cheapening of cost, owing to the economy of plant, since one would use merely a rotary fan. Such furnaces would be far less noisy to work.

It is now generally agreed that the working costs of the gas-fired furnace, under works and not test conditions, can be equalled by an ordinary well-designed coke-fired plant, and particularly by installation of the square-furnace type, such as have given good results in Birmingham and elsewhere. The advantages claimed for gas-fired installation, such as increase of output and longer life of crucible, appear to be offset in works practice by the breaking down of the furnace refractories under the influence of local heating of the latter in gas-firing, a lack of uniformity in heat distribution, and the risks of absorption of gas during melting operations. The pouring temperature has a great influence on the consumption of gas and another cause of wide difference in the melting figures for the same metal is its physical state. Thus the

[1] Journal Institute of Metals, 1920, 24, 76.

more finely divided the metal the more gas is required for melting. Usually ingots and heavy scrap are the easiest to melt whilst light scrap and swarf may require double or treble as much gas as ingots.

The choice of furnace for brass melting is largely regulated by the class of work to be done. For comparatively light castings of varying weight and composition the coke or gas-fired pit furnace is generally preferred, but for large quantities of metal of uniform composition required at regular intervals for heavy class work the tilting furnace, either coke or gas-fired, is found to be more efficient and economical, owing to the lower fuel consumption, longer life of crucible and less labor required. The crucible capacity for small size tilting furnaces is usually about 120 to 150 lbs., but the larger furnaces have a maximum capacity of 1,000 to 1,200 lb. Crucible tilting furnaces of relatively large capacity developed during the ten years previous to the outbreak of war found extensive use during the war period. So far was this the case that taking into consideration the tilting furnaces existing before the war together with those installed for war work, it is probable that about one-third of the total annual output of brass in recent years was melted in tilting furnaces. The average all-round working heat efficiency of the coke-fired crucible tilting furnaces on 70:30 brass is stated to be about 15 per cent. Preheaters are attached to most of the modern crucible furnaces in use both for pre-heating the metal charge and in some cases the air supply.

Reverberatory or air furnaces capable of melting several tons of metal are in use where large quantities of metal are required for heavy castings. These are usually coal-fired, but the application of gas-firing is receiving attention and has been adopted in some cases. For large quantities such furnaces are more economical and speedy to use than a number of smaller furnaces, and give a product more homogeneous in composition. When several small furnaces are used it is difficult to collect the pot charges into a ladle, and keep the metal warm enough for casting.

Electric Furnaces in Great Britain.

The application of electrical energy for melting brass and other copper alloys offers many advantages, and the development of furnaces of this type on the Continent and in America is being watched with great interest. So far the high cost of power has done much to delay more adequate attention being given in England to electric melting, but there is little doubt that a substantial reduction in electric power costs will bring these furnaces into great prominence.

Owing to the comparatively low temperatures involved in melting most non-ferrous metals and alloys as compared with iron and steel, the electric furnace has not yet, on financial grounds, justified its employment for brass and similar alloys, except when dealing continuously with comparatively large quantities of material of uniform composition. The accurate control of working temperature and atmosphere, however, which the use of electric furnaces confers appears to mark it as one of the furnaces of the future.

Electric furnaces of the resistor type, in which a crucible is either heated externally or itself acts as the resistor, appear to be the type that appeals most to the brass melter, especially if provision is made for lifting the crucible out of the furnace to permit of hand-casting. Several forms of transformer furnaces for melting brass have been developed in England and on the Continent, and in this type the carbon crucible acts as the resistor to the passage of the alternating current and thus generates the necessary heat. This type of furnace is preferred because it conforms to the more varied requirements of general brass foundry practice, where usually comparatively small quantities of a number of alloys of different compositions have to be handled. Several furnaces of this type with a capacity up to 100 lb. or more of metal have been introduced in recent years and are being experimented with at several works. In cases where large quantities of one or two particular alloys only have to be dealt with, and for the melting of scrap, etc., electric furnaces of large capacity up to one-half ton or more are in use, but are so far in the experimental stage.

There would appear to be comparatively little scope in the British brass industry for electric furnaces of large capacity such as the Ajax-Wyatt, Detroit Rocking, and the Baily, in which the bulk of the electric brass melting has been done in America. These furnaces require large and expensive installation and must be operated continuously on one or at most two standard alloys before any material saving can be shown. These conditions do not apply to a large majority of the British works, many of which have only an average monthly output of from 500-600 lb. or even less and are called upon to supply such a variety of alloys and products that they cannot economically operate a furnace of one-half to one ton capacity continuously.

In addition to the introduction of newer types of furnaces considerably more attention has been given in recent years to details of casting technique, such as temperature of the metal, rate of pouring, dressing of moulds, etc., all of which are important factors in the production of sound metal. In this connection mention must be made of the use of the fireclay dozzle or feeder head which has been strongly advocated by W. R. Barclay and others during the past five years, for the production of sound ingots as free as possible from pipe. As is well known, such dozzles have long been used in crucible steel casting and have done much to render the "feeding" of the molten metal into the ingot mould more efficient.

The hot dozzle inserted at the top of the ingot mould acts as a small secondary crucible holding the metal in the liquid state at least sufficiently long to allow it to be drawn into the interior of the ingot as required by the shrinkage cavity.

Where the feeder head has been introduced it has been of considerable assistance in producing sound brass ingot metal. The usual method of pouring adopted by the brass caster differs, however, from the steel caster's method and militates against the use of the feeder head, consequently when the non-ferrous metal caster employs the feeder head he must conform more closely to the steel caster's method. An objection sometimes urged against the use of the dozzle is that it can only be used once and is then scrapped, but although this is the case, experience has shown that the initial cost of the dozzle is invariably covered by the larger percentage of sound ingots that result from its intelligent use.

With regard to general foundry work some type of moulding machine is now almost universally employed for repetition work in which large numbers of duplicate castings are required. There has been a considerable

extension in the use of moulding machines during the past few years and in this respect British manufacturers are indebted to American inventors for many of the most serviceable machines in use.

(To be concluded).

Chemical Society News

APPOINTMENTS TO COMMITTEES FOR CANADIAN INSTITUTES.

The Committee in connection with the International Union has reported to the President, and he has approved the same, subject to approval of Council, the following appointments:

To represent Canada on International Board for three years—Dr. Baril and Dr. Ruttan.

To be corresponding members for the following respective committess::

1. Bureau des Etalons Physico-Chimique—Dr. Lash-Miller.
2. Pure Products for Research—Dr. A. Neish.
3. General Information Bureau—S J. Cook.

Also for the Publicity Committee the following—W. C. Lodge, F.C.I.C., Chairman; L. E. Westman, M. Henkey—with power to add.

Mr. Henkey is an experienced Press man, not a chemist, but one who has shown a special aptitude for the work. This publicity relates to Chemistry in Canada as a whole, and not to the Institute as such.

It is proposed by Council to have University branches named after the University, in accordance with the request of several Universities, e. g., "Queen's Branch of the Canadian Institute of Chemistry," this being the locality at which the branch is situated.

STUDENT MEMBERS OF CANADIAN INSTITUTE OF CHEMISTRY ENROLLED UP TO NOVEMBER 1st, 1921.

Atwell, James, 461 Albert St., Kingston, Ont.; Anderson, Lorne Campbell, 450 Johnston St., Kingston, Ont.; Beattie, Robert Walter, 218 University Ave., Kingston, Ont.; Bronson, E. H., 81 William Street, Brantford, Ont.; Burns, James Charles, 61 Frontenac St., Kingston, Ont.; Brown, Wilfred M., 144 Collingwood St., Kingston, Ont.; Corneil, Robert Gordon, 184 Barrie St., Kingston, Ont.; Cooper, Nelson C., 107 Frontenac St., Kingston, Ont.; Elliott, Freeman Wixon, Queen's University, Kingston, Ont.; Furse, G. D., Queen's University, Kingston, Ont.; Griffin, Howard Stanley, 173 Union St., Kingston, Ont.; Heatley, Albert Harold, Box 579, Brampton, Ont.; Hanna, John Arthur, 249 Johnston St., Kingston, Ont.; Hayes, Arthur Clarence, 107 Frontenac St., Kingston, Ont.; Hunter, Harry Cecil, Queen's University, Kingston, Ont.; Jacques, Alfred George, 422 Yorke St., London, Ont.; Manske, Richard H. F., Queen's University, Kingston, Ont.; Maybee, G. R., 9 St. Lawrence Ave., Kingston, Ont.; Notman, Donald O., 391 Earl St., Kingston, Ont.; O'Brian, Colin Lewis, L'Original, Ont.; Patterson, Wilfred Earnest, 158 Frontenac St., Kingston, Ont.; Pasternack, David Samuel, 130 Union St., Kingston, Ont.; Robson, Homer L., University of Saskatchewan, Saskatoon, Sask.; Stephens, L. E. R., Queen's University, Kingston, Ont.; Small, Samuel Welberne, Queen's University, Kingston, Ont.; Stewart, George Earnest, 428 Brock St., Kingston, Ont.; Thomas, Frank Delbert, Queen's University, Kingston, Ont.; Waddington, R. Hings, 206 Bagot St., Kingston, Ont.; Wynne-Roberts, Robert Iorwerth, 20 Selby St., Toronto, Ont.; Wiggett, Walter F., c/o Brompton Pulp & Paper Co., East Angus, Que.

QUEEN'S BRANCH HEARS ADDRESS ON METALLOGRAPHY.

A large gathering of students took place at Queen's University, Kingston, Ont., on Friday, Nov. 4th, when an address on Metallography was given by Harold J. Roast which was much appreciated. Following the address, Mr. Roast explained the various activities of the Canadian Institute of Chemistry with particular reference to the formation of Student Branches. As a result of an appeal made, over thirty student members were secured. The chair was filled by Mr. A. G. Jacques, Chairman of the new Queen's Branch, Mr. W. E. Patterson is the Secretary. Queen's is to be congratulated on being the first to form a branch of the Institute and on the evident signs of active interest taken by the Students in the national Chemical organizaion.

CHANGE OF ADDRESS.

The following changes of address of members of the Canadian Institute of Chemistry are announced: E. E. Wells, to 42 Union Ave., St. Lambeth, Quebec; W. S. Chase, to 7517 Franklin Ave., Cleveland, Ohio.

NEW APPLICATIONS FOR MEMBERSHIP.

Ten new applications for Fellows and Associates have been received by the Council of the Canadian Institute of Chemistry. These are now under consideration by the Examining Board.

NEW MEMBERS OF CANADIAN INSTITUTE.

Mr. W. K. McNeill, 5 Queen's Park, Toronto, has been elected a Fellow of the Canadian Institute of Chemistry.

Mr. Albert Harold Heatley, P.O. Box 579, Brampton, Ont., has been elected a Student member of the Institute.

STUDENT MEMBERSHIP OF INSTITUTE GROWING.

To date over thirty student members have been enrolled at the Queen's University Branch of the Canadian Institute of Chemistry, while some thirty-five students are being enrolled at the University of Toronto Enrollment of student members from McGill University is proceeding favorably, and as soon as these branches are complete a list of their members will be published in the Journal.

SHAWINIGAN FALLS SECTION, SOCIETY OF CHEMICAL INDUSTRY

A well attended meeting of this Section was held on Wednesday, November 16th at 7.30 p.m., Dr. Skirrow being in the Chair. The speaker of the evening was Mr. Harold J. Roast of the James Robertson Company and McGill University, Secretary of the Canadian Institute of Chemistry, who gave an illustrated address entitled "The Inner Life and Activity of Metals." The lecturer showed the crystalline nature of all pure metals, and explained the reason why fineness of grain meant a stronger metal. Explanations were given to show

the reason for the ductility of malleable iron being so much greater than ordinary gray iron, due to the form in which the free carbon existed. Reference was made to the toxic effects of certain metals and metalloids whereby the presence of a mere trace of the material in question had a very marked and deleterious effect on the quality of the alloys containing them. Reference was made to Copper containing small quantities of Bismuth which could be sawn in a manner similar to hard wood, whereas pure Copper was most difficult to saw. Other references to the pathological condition of metallic alloys were made showing an anology to some extent between the treatment of metals and men. Explanation was given of the structure desired in a bearing metal and the slides shown gave a clear idea of the part played by the various components of bearing metal alloys. A lively discussion followed.—F. E. Dickie, Secretary.

PROGRAMME SOCIETY OF CHEMICAL INDUSTRY, MONTREAL SECTION.

Session 1921-1922.

October 28th—Ladies' Night at Queen's Hotel, 8 p.m.

November 18th—Carbonization of Western Lignite. Prof. R. De L. French (McGill).

Paper on Uses of Pitch Resulting from Carbonization of Lignite. Dr. Georges Baril (Univ. Montreal).

New Commercial Method for the Decomposition of Clays and Feldspars. By E. Levitt. At Queen's Hotel. 8 p.m.

December 16th—Wireless Telephony. By Prof. Eve (McGill), assisted by D. R. P. Coates and the Marconi Company. Physics Bldg., McGill, 8.15 p.m.

January 19th—Administration of the Explosives Act in Canada. By Lieut.-Col. G. Ogilvie, Chief Inspector of Explosives. Joint Meeting of the Montreal Section of the Engineering Institute.

The Electric Steam Generator and Its Possibilities. By F. T. Kaelin (Queen's Hotel).

February 20th—A special meeting will be held to hear Dr. C. K. Mees of the Eastman Kodak Company on "Chemistry and the Motion Picture."

March 17th—Water Supply Purification. By Jas. O. Meadows.

Cement—An Investigation of some Causes of its Disintegration. By A. G. Fleming. (Queen's Hotel).

April 7th—A paper will be presented by Mr. S. R. Church of the New York Section.

April 28th—Annual meeting and smoking concert.

SOCIETY OF CHEMICAL INDUSTRY, MONTREAL SECTION.

Opening Meeting, held at Queen's Hotel, Montreal, Oct. 29, 1921.

The opening meeting was somewhat of a departure from those of former years inasmuch as the Society entertained their lady friends. The meeting was preceded by a dinner at which about forty-six members and guests were present.

After the dinner the meeting was called to order (although the "order" was rather conspicuous by its absence) by the Chairman, Mr. Matheson.

The first item on the program was "Chairman's Remarks." Mr. Matheson spoke briefly, alluding to the recent Annual General Meeting of the Society, held in Montreal, and said that the contact which had been established between the Canadian and English members during this convention should go far towards increasing the interest and enthusiasm of the members on this side. He added that the Society in Canada had room for great development and appealed to all the members to assist the Membership Committee to the best of their ability in securing new members. In addition to the educational value of our meetings, he felt that they had a distinct social value to the chemist who, as a class, is a poor social mixer, due to the fact that he spends such a large part of his time in the comparative solitude of the laboratory and does not come into contact with men.

He then spoke of the proposal to form a Council for Canada to deal with matters peculiarly Canadian in interest. The Council in London has approved of the scheme, and it is planned that representatives from each section be appointed to look after the organization of this Council. In this way, the different sections can combine their forces to take collective action on any matters of interest, such as influencing legislation, etc.

The Treasurer announced that the finances of the Section were in excellent shape.

Mr. McIntyre submitted the report of the Special Committee on Constitution and By-Laws. The report was approved and a copy of the By-Laws is being sent to London for the consideration of the Council.

Mr. Matheson announced that it is proposed to form in Canada an Engineering Group within the Society. This Engineering Group was formed in England to take care of the needs of those particularly interested in the engineering side of chemistry. Membership is open to any member of the Society upon payment of one guinea. The group issues its own proceedings or transactions in a bound volume, which contains much matter of engineering interest and information. Applications for membership may be made to the secretary of each section, and after its formation it will elect its own executive. The members of each section will elect representatives, who will meet to organize the group. It is planned to have one group in North America, which will embrace the New York, as well as the Canadian Sections.

Mr. Woodland announced a very comprehensive programme for the season. Mr. Wardleworth, a vice-president of the society, moved a vote of thanks to those who had contributed to the entertainment.

After singing "Auld Lang Syne," the floor was cleared and dancing was the order of the evening. The meeting was one of the most successful in the history of the Section.

W. W. DICKSON, Secretary.

SOCIETY OF CHEMICAL INDUSTRY MONTREAL SECTION.

The second General Meeting of the Society was held on November 18th at the Queen's Hotel, the Chairman, H. W. Matheson, presiding. Fifty-three members and guests were present, including Dr. Ruttan, the new President of the Society.

The matter of the formation of a General Council for Canada was discussed at some length and the importance of this Council was pointed out, both by the Chairman and by Dr. Ruttan, in dealing with matters of common interest to all the Sections in Canada, such as in influencing legislation, etc. A motion was unanimously passed endorsing the general idea of forming a Canadian Council, and the Chairman and the immediate past-Chairman were appointed as representatives of the Montreal Section.

The formation of the Engineering Group for the United States and Canada was discussed at the previous meeting and copies of the Proceedings of the Group were distributed to those interested. It was explained by the Chairman that since this time it is understood an Institute of Chemical Engineers is being formed in England, the Montreal Section postponed the consideration of the organization of the Group until further information is secured from England regarding the effect of the formation of this Institute on the Engineering Group.

A paper was read by Professor R. de L. French, Chief Engineer of the Lignite Utilization Board of Canada, on "The Carbonization of Western Lignite." Prof. French pointed out the very large deposits of this lignite extant in Western Canada and the dependence of this section of Canada on the importation of coal from the United States. For this reason the utilization of Western lignite has been investigated by the Board. Those deposits existing in Saskatchewan are of low grade and friable in nature, so that their transportation is impossible. Carbonization on the spot, therefore, had to be resorted to and the material converted into a coke suitable for use after its conversion into briquettes. Prof. French illustrated in detail the design of the carbonizers which are now being put into use in the Western province. Carbonization takes place by securing a uniform flow of the lignite over the inclined bed of the carbonizing chamber, the heating being done by the gas from carbonization. The bed of the carbonizing chamber consists of Carborundum plates, closely fitted together. The gas escaping is washed from the tar in tanks and the gas utilized in the carbonizing chamber, the amount of gas just being sufficient to effect the carbonization.

So far no efforts have been made to recover the Ammonia, and it was Prof. French's opinion that the amount is so small as to preclude the possibility of its economical recovery. The tar also, it is proposed to burn at the present time in heating the carbonizers. In conclusion, Prof. French pointed out that the whole proposition was still in the experimental stage and undoubtedly many improvements would still be effected before the project was a commercial success.

A second paper was read by Mr. Levitt on a New Commercial Method for the Decomposition of Clays and Feldspar. The method briefly consits in the fusion of the clay or feldspar with calcined boric acid. For feldspar, the proportions are two parts of feldspar to one part boric anhydride; and for clay, equal parts are used. This mixture is calcined at a temperature of about 1,500°C. The resulting product is treated with water, finely powdered, and sulphur dioxide passed into the mass, suspended in water, the temperature being kept under 60°C. The borates are decomposed, forming bi-sulphites of the metals and boric acid. The material is then filtered, the filter cake consisting of boric acid and silica. The cake is then washed with hot water for the recovery of the boric acid and the residue consists of pure silica, which is readily dissolved in caustic soda for the manufacture of sodium silicate. The filtrate is now boiled, sulphur dioxide escaping, and aluminum hydroxide precipitates. This material after filtering may be used for the manufacture of aluminum sulphate or calcined for conversion to alumina for the manufacture of aluminum. The filtrate may then be treated for recovery of potash salts.

In discussion, some doubt was thrown on the process, due to the fact that most processes for the treatment of feldspar resulted in incomplete solution of the aluminum and potash. Mr. Levitt, however, assured the meeting that complete solution was effected by this process and that 99.5% of the boric could be recovered for re-use.

ANNOUNCEMENT OF TORONTO MEETING OF AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The seventy-fourth meeting of this association will be held at the University of Toronto during the last week in December, by joint invitation of the University and the Royal Canadian Institute. Members of this association represent wide fields of scientific endeavor. Mathematicians, engineers, biologists, physicists and chemists join to discuss progress. The meetings are regularly attended by the most prominent scientific thinkers on the continent, and this year it is hoped that European representation will be large.

At the opening meeting, December 27th, Prof. E. H. Moore, of Chicago, will preside as president, and Dr. S. O. Howard will deliver his address as retiring president. Prof. Moore is known as a very distinguished mathematician, and Dr. Howard is noted for his work on entomology. Many affiliated and associated scientific societies will meet at Toronto, and their several programmes will provide scientific entertainment for all.

The first Canadian meeting was held in Montreal in 1857. A second meeting was held there in 1882, and the first Toronto meeting in 1889. Since that time no meeting has been held in the Dominion until now. The membership has grown from 1952 in 1889 to about 12,000.

Toronto has much more to offer visitors now than then, and full opportunity will be given all to visit the buildings of the university, other educational institutions, hospitals and laboratories. A number of industrial exhibits of scientific apparatus will be presented by leading manufacturers and arrangements are being made for the special entertainment of visitors and their introduction to Canadian winter sports. Besides a great number of committees, Dr. J. C. Fields and Mr. H. S. Seymour, president and secretary of the Royal Canadian Institute, have the meeting in charge.

PRESENT MEMBERS OF THE ASSOCIATE COMMITTEE OF CHEMISTS UNDER THE HONORARY ADVISORY COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

R. F. Ruttan, B.A., M.D., D.Sc. (Chairman), Director Department of Chemistry, McGill University, Montreal; John Bates, Chem.E., Ph.D., Research Chemist, The Bathurst Company, Bathurst, N.B.; H. E. Bigelow, Ph.D., Professor of Chemistry, Mount Allison University, Sackville, N.B.; Maitland Boswell, B.A.Sc., Ph.D., Faculty of Applied Science, University of Toronto, Toronto, Ont.; Alfred Burton, Esq., Middlesex Mills, London, Ontario; Paul Cardinaux, D.Sc., Laval University, Quebec City, P.Q.; J. R. Donald, B.Sc., J. T. Donald & Co., 318 Lagauchetiere St. West, Montreal; Horace Freeman, F.C.I.C., 567 Hornby St., Vancouver, B.C.; R. A. Gilmore, M.A., M.Sc., Chief Chemist, Standard Chemical Company, 511 St. Catherine St. West, Montreal; Fred. J. Hambly, F.I.C., Electric Reduction Company, Buckingham, P.Q.; Robert Job, A.B., Milton Hersey Company, Limited, 84 St. Antoine St., Montreal, P.Q.; A. F. L. Lehmann, B.S.A., Ph.D., Professor of Chemistry, University of Alberta, Edmonton, Alberta; Neil Macallum, B.A., Ph.D., Synthetic Drug Company, Toronto, Ontario; I. C. Mackie, B.A., Chief Chemist,

Dominion Steel Corporation, Sydney, N.S.; A. E. McIntyre, Ph.D., Dominion Department of Explosives, Ottawa, Ontario; Arthur C. Neish, M.A., Ph.D., Director Department of Chemistry, Queen's University, Kingston, Ont.; J. W. Shipley, B.A., Ph.D., Department of Chemistry, University of Manitoba, Winnipeg, Manitoba; T. Thorvaldson, B.A., Ph.D., Professor of Chemistry, University of Saskatchewan, Saskatoon, Sask.; Dr. Harold van der Linde, Esq., President, Van der Linde Rubber Company, 142 Weston Road, Toronto, Ontario; T. H. Wardleworth, F.C.S., National Drug and Chemical Company, Limited, 34 St. Gabriel St., Montreal; R. A. Witherspoon, A.B., Manager, Canada Carbide Company, Shawinigan, P.Q.

Corrected to November 14, 1921.

BOOK REVIEWS

"THE VITAMINE MANUAL."

By Walter H. Eddy; 121 pp.; Williams & Wilkins Co. Price, $2.50. (U.S.A.)

This is a presentation of essential data about the new food factors, which have had quite a run through scientific and semi-scientific professional circles.

For average consumption, data concerning vitamines had grown to the point where "boiling down" was absolutely necessary. The author states that an attempt has been made to include important contributions up to April, 1921. In this connection, he has been fortunate in having the assistance of members of the staff of the Department of Food Chemistry at Columbia University.

The subject matter is presented in a most pleasing style, and we believe will be received by all professional groups concerned, as a manual of real practical value.

The main classifications as chapters deal with:—

1. How vitamines were discovered.
2. Attempts to determine chemical nature.
3. Methods used in testing for vitamines.
4. The yeast test for vitamines.
5. Sources of vitamines.
6. Chemical and physiological properties of vitamines.
7. How to use vitamines in diets.
8. Diseases resulting from vitamine deficiencies.

The whole is supplemented by a most complete set of references to original articles.

"TECHNICAL METHODS OF ANALYSIS."

By Roger C. Griffin; McGraw-Hill Book Co.; 666 pp. Price, $6.00. (U.S.A.)

For the general chemist employing technical methods of analysis, such a reference forms a valuable and safe guide. The methods are standard for the most part, and have been written up with due regard to practical considerations and general application. The staff of the Arthur D. Little Co. have co-operated in the work, and much of the detail is the result of their practical experience. Special work is not covered, but all ordinary analysis, both organic and inorganic, are discussed in good detail. Special chapters deal with metals, fuels, paints, oils, fats, soaps, wood, paper, textiles, fibres and foodstuffs. Under the head of miscellaneous analyses comes leather, water, rubber and a variety of specific industrial products.

It is the kind of book in which an analyst is apt to find exactly what he requires in many instances, and that detail in instructions is present which saves a beginner from very foolish or grave errors. The book will undoubtedly find many friends among those who are constantly called upon to do general analytical work.

BRITISH INDUSTRIES FAIR.

The eighth annual British Industries Fair which embraces a large number of the most important lines of British trade, will be held in London and Birmingham from 27th February to 10th March. This is purely a trade fair where buyer and seller meet, not an exhibition. This Fair, whether regarded from the point of view of size, diversity of products shown or resultant business, now surpasses in importance and value to the world's markets, any other trade fair of similar purpose. A visit to the Fair will convince overseas buyers that enormous strides have been made in Britain's post war production. A considerable number of Candian buyers are making arrangements to attend. Admittance is restricted to trade buyers on invitation of the British Government and business is not impeded by crowds of sightseers.

While participation in the Fair is confined to manufacturers in the British Empire as exhibitors, many overseas buyers will undoubtedly continue to utilize the services of merchant houses who fill so important a role in the export trade of the United Kingdom. From the buyer's point of view, however, the Fair has the great advantage of personal contact with the actual producer.

Special reading and writing rooms are available where buyers may consult qualified officers of the Department who will be able to indicate sources of supply of any goods required and to give information regarding tariffs, shipping and transport, trade conditions, etc., throughout the world. The catalogue of the Fair is a mine of information for it is not merely a list of exhibitors, but a book of trade reference of great value.

The British Industries Fair covers, among others, the following industries at London:

Cutlery; silver and electro-plate; jewellery; glassware of all descriptions, china, earthenware and stoneware; paper; leather for the boot and shoe, fancy goods, bookbinding and upholstery trades; scientific and optical instruments; medical and surgical instruments and appliances; spectacle ware and opticians' supplies; photographic and cinematographic apparatus and requisites; carpets, linoleum, etc.; basketware, chemicals, light and heavy; domestic chemical products; drugs and druggists' sundries; perfumery; dyes; foodstuffs (prepared and preserved) and beverages; confectionery (sugar and chocolate); tobacco, cigarettes and cigars.

At Birmingham.

Lighting plant for electricity, gas, oil, etc.; general machinery of all descriptions and small tools; mill furnishings; india rubber goods for industrial and household purposes; weighing and measuring appliances and instruments; sanitary appliances; paints, colors and varnishes and painters' requisites; railway equipment; metals of all descriptions (excluding precious metals); agricultural and horticultural machinery and implements; mining, colliery and quarrying plant; brewing and distillery plant; saddlery and harness; tubes in copper, lead, brass and steel and steam pipe fittings; architectural and ornamental metal work, including gates and fencing; ropes of steel and hemp, cordage and string.

The London Section of the Fair will, as in 1921, be housed in the White City, a large group of exhibition buildings within a few minutes of the centre of London. The Birmingham Section will again be in the great buildings of the Castle Bromwich Aerodrome.

The British Trade Commissioners in Canada will be pleased to give full particulars and to issue invitation cards to Canadian buyers who propose to visit the Fair at their following addresses: 248 St. James Street, Montreal; 260 Confederation Life Building, Toronto; 610 Electric Railway Chambers, Winnipeg.

SUMMARY OF CANADIAN TRADE RETURNS TWELVE MONTHS ENDING OCTOBER, 1921.

The Dominion Bureau of Statistics, External Trade Branch has issued a report on Canadian trade, covering the twelve months ending October, 1919, 1920 and 1921.

1.—Imports and Exports by Main Groups.

	Twelve Months ended October. 1919	1920	1921
Imports for Consumption.			
Vegetable Products	$180,658,495	$287,513,483	$202,440,373
Animal Products	87,342,694	87,403,635	44,256,714
Fibres and Textiles	174,033,287	316,969,042	133,309,747
Wood and Paper	38,105,368	55,423,320	42,640,042
Iron and its Products	181,729,626	244,460,666	151,474,003
Non-Ferrous Metals	44,115,212	61,411,007	35,536,171
Non-Metallic Minerals	118,912,628	172,025,954	170,044,891
Chemical Products	28,021,300	40,237,227	23,944,554
Other Commodities	69,440,828	74,195,120	55,979,772
Total Imports	902,359,438	1,339,639,454	859,626,267
Dutiable Goods	565,279,016	887,486,088	592,042,272
Free Goods	337,080,422	452,153,366	267,583,995
Duty Collected	161,317,422	210,236,382	127,481,946
Exports (Canadian)			
Vegetable Products	359,781,267	405,891,497	430,339,457
Animal Products	305,652,558	252,506,597	156,568,646
Fibres and Textiles	26,659,025	29,231,556	10,072,703
Wood and Paper	180,379,215	282,703,958	199,231,463
Iron and Its Products	91,133,347	82,825,354	42,737,133
Non-Ferrous Metals	60,742,371	56,283,909	31,606,361
Non-Metallic Minerals	26,647,638	41,979,140	28,027,979
Chemical Products	33,468,443	22,120,952	11,523,573
Other Commodities	112,860,943	55,277,618	16,546,807
Total Exports (Canadian)	1,197,342,807	1,228,820,581	926,654,122
Foreign Exports	54,709,151	34,963,952	14,912,313
Total Exports	$1,252,051,958	$1,263,784,533	$941,566,435

2.—Imports from and Exports to United Kingdom and United States Twevle Months ended October, 1921.

	Imports for Consumption. From United Kingdom.	From United States.	Exports Canadian Produce. To United Kingdom.	To United States.
Vegetable Products	$36,360,240	$97,503,321	$175,428,236	$114,457,271
Animal Products	2,646,029	34,212,789	81,335,755	56,487,611
Fibres & Textiles	49,877,988	62,823,621	1,094,836	4,396,472
Wood and Paper	2,909,318	37,904,287	18,060,541	157,725,192
Iron	11,444,816	138,502,718	6,335,576	7,236,242
Non-Ferrous Metals	3,192,250	30,055,759	7,972,027	17,676,916
Non-Metallic Minerals	6,792,072	151,922,735	4,067,872	14,361,068
Chemical Products	3,452,000	17,243,243	1,167,046	8,102,395
Other Commodities	12,360,833	38,888,800	1,316,195	11,612,851
Totals	$129,035,546	$609,057,273	$296,778,084	$392,056,018

It is to be noted that "Chemical Products" mentioned in first and second table includes, not only chemica's, but products such as dyes, paints, pigments, varnishes, soaps, perfumes, explosives, tanning materials, etc. From these main group headings the following articles are given as of particular interest to our readers:

Imported for Consumption—twelve months ending October, 1921—Chemicals, $15,912,520, as compared with $26,919,777 for a similar period ending October, 1920; paints, colors and varnishes, $2,898,525, as compared with $4,408,391 for simi'ar 1920 period; soap, $1,117,153, as compared with $1,771,737, 1920 period; copper, $4,807,529, as compared with $10,498,288, 1920 period; iron and steel, $125,680,710 as compared with $200,855,844 for 1920 period; tin, $6,873,635, as compared with $15,892,301, 1920 period. It should be noted that the metals just given include the metal and its products, not simply the ore or the metal itself.

Exported during twelve months period ending October, 1921, the following: Aluminum, bars, etc., $1,423,884, as compared with $7,348,397 during similar period ending October, 1920; asbestos, $6,781,382, as compared with $11,957,564 for similar 1920 period; copper, $8,990,185, as compared with $15,343,897 for 1920 period; gold, $2,574,125, as compared with $4,693,449 for similar 1920 period; silver, $8,733,791, as compared with $13,301,197 for 1920 period; nickel, $5,297,226, as compared with $11,047,341 for 1920 period; iron and steel, $31,922,699, compared with $61,-878,342 for similar 1920 period.

GERMAN TRADE, 1920—EXPORTS AND IMPORTS.

The German Ministry of Economics, through its statistical bureau, presents figures for German trade in 1920. We give a few items. Period is year, to December 31st, and the items do not include reparations delivered under the Treaty of Versailles:

	Imports tons	Exports. tons.
1. Agricultural, animal and vegetable products, including foodstuffs	7,233,858	1,533,777
2. Animal and vegetable spinning materials and manufacturers thereof, including human hair, prepared feathers, fans and hats	96,076	86,276
3. Chemical and pharmaceutical products, including dyes and dyestuffs	292,811	2,901,761
4. Glass and glassware	15,317	130,543
5. Goods prepared from bones, wood, cork, and other plant dissection	7,825	141,859
6. Machines, vehicles and electro-technical products	8,974	741,419
7. Metals: Coarse, and manufactures of	583,581	2,036,921
8. Minerals and fossil raw materials, and mineral oils	12,279,505	13,060,036
9. Paper and pulp, and manufactures of	88,263	305,440
10. Stones and other materials, (excepting clay) and fossil materials, manufactures of	26,046	350,996
11. Wax (prepared), paraffin, and related products, including soap, and other fatty substances, oils, and wax manufactures	45,402	9,038

"Chemical and Pharmaceutical products including dyes and dyestuffs," still loom large, nearly three million tons, justifying to some extent the apprehension felt in various quarters as to recently established chemical works. Food and soap are included in the only two classes where imports largely exceed exports. Foodstuffs amount to about 300 pounds per capita, a fair proportion of the total food consumption. Exports of paper and pulp do not seem to justify the view that there is a German menace to the North American paper industry. The total paper exports, if shipped entirely to the United States, would be less than five per cent. of the per capita consumption.

NEW FERTILIZER PLANT NEARS COMPLETION.

Scottish Fertilizers, Limited, situated at Welland, Ont. state that their new plant is nearing completion, and it is expected that operations will commence early in the new year. The plant has been designed with the best English and American practice.

REPORTS RECEIVED.

"Commercial Feeding Stuffs."

The Division of Chemistry of the Dominion Experimental Farms, Ottawa, has recently issued a bulletin, No. 47, "Commercial Feeding Stuffs." This bulletin contains the chemical analysis and microscopical findings of over four hundred samples of feeding stuffs collected throughout the Dominion, and includes a consideration of all the more important by-products and compounded feeds now found on the Canadian market. The bulletin should prove of very considerable value to those concerned in the purchase and use of commercial feeding stuffs, and the Division of Chemistry are to be congratulated on the work they have done in this connection. Copies may be obtained from the Publications Branch, Department of Agriculture, Ottawa.

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Chemical, Oil and Metal Markets

The quotations below represent manufactures' and wholesale importers' prices at Toronto, Montreal, or other Canadian points.

CHEMICALS.

Trading in chemicals throughout November, while not quite as good in volume as in October, did not register any serious declines in prices, and it is encouraging to note that December has opened with increased activity, and the indications are that a much better tone will prevail in the chemical market throughout December as compared with November.

Of the declines, the most noticeable are the chlorides, bleaching powder, caustic soda, potassium bichromate and hydroxide (caustic potash), acetanalid, and whiting (American grade).

Quotations on yellow prussiate of soda have stiffened and none can be got under 16 cents per lb. The heavy acids (sulphuric, muriatic, nitric), are holding firmly with no prospects of further declines; all grades of acetic acid remain unchanged. Magnesium sulphate quotations are also holding steady. All grades of wood alcohol remain unchanged and further declines are very unlikely, indeed producers could not well manufacture at any lower levels than those now prevailing. Acetone prices also remain unchanged.

Caustic soda declined a ¼c per lb. and the ground is quoted at from $6.50-$6.75 per cwt., with the solid selling at ¾c lower per lb. Bleaching powder eased off from ¼c to ½c per lb., depending on the quality purchased, and quotations are from .03¾c-.04¼c per lb. With a better demand from the paper mills in sight, it is not expected that any further declines in bleach will occur, but, of course, general business conditions will determine the future course of this commodity, as with many other chemicals used in a large way by large industries, such as the paper industry.

There seems to be a better feeling on the part of the trade to contracts, and in this connection a large order was recently given by one of the Ontario rubber works for zinc oxide, at a very fair price.

The sliding movement that prevailed during the past six months in pharmaceutical chemicals and drugs seems to have been halted, in most lines at least, and prices, on the whole, are holding fairly steady, with prospects for better trade during the winter months.

METALS.

Steel—The Canadian steel market shows some improvement and it is thought that there will be no further decline in prices this winter. The present rate of production is about 45 per cent. of capacity. Of the different lines of steel materials, pipe mills are the busiest and are operating at about 70 per cent. of normal production. There have been two large orders placed with Canadian steel producers during the past month which have encouraged the trade considerably. An order has been placed for 4,300 tons of steel to be used in the construction of the new Mount Royal Hotel, at Montreal. Additional rail orders, aggregating 21,000 tons, have been promised to the Sydney mills of the British Empire Steel Corporation by Canadian Government railways, according to the report of a civic committee of Sydney who interviewed Government authorities.

Copper—The copper market has shown improvement, quotations having advanced $1 per cwt. since November 1st. Lead and zinc are also in a better position with quotations advanced.

Asbestos—It is encouraging to note that the asbestos market is improving. The situation at the mines in Quebec is very much better. During the month of August the work schedule was four days per week, and during September this was increased to six days a week. The increased demand will eventually make a better price.

Tin—The present low price of tin is due to the accumulation of a six months' supply in foreign markets. Below 30 cents per lb., production of tin is unprofitable, and the Bolivian tin mines have had to suspend operations. Locally, however, the demand for tin has shown a slight increase and quotations have advanced from 35 to 38 cents per lb. Tin mills are running at about 60 per cent. of normal production.

CANADIAN PRICES QUOTED BY MANUFACTURERS OR WHOLESALERS.

General Chemicals and Industrial Minerals.

Inorganic.

Alum, Ammonia, lump and ground	100 Lbs.	4.75— 5.25
Ammonium Bromide	Lb.	.. — .45
Aluminium Sulphate, bags	100 Lbs.	.. — 2.50
Aluminium Sulphate, iron free	Cwt.	.. — 4.50
Ammonia, Aqua 26	Lb.	.11— .12
Ammonium Carbonate	Lb.	.12— .15
Ammonium Chloride	Lb.	.08— .11
Ammonia Iodide	Lb.	.. — 6.30
Arsenic	Lb.	.. — .14
Barium Sulphate (Barytes)	Per Ton	30.00—35.00
Barium Chloride	Lb.	.04½— .06
Barium Nitrate	Lb.	.. — .20
Barium Peroxide	Lb.	.. — .20
Barium Sulphate, B.P.	Per Ton	100.00—110.00
Battery Acid, up to and including 1.400 sp. gr.	Cwt.	3.00— 3.50
Battery Acid, over 1.400, up to and including 1.835 sp. gr.	Cwt.	3.50— 4.00
Bleaching Powder, 35% drums	100 Lbs.	.03¾—.04¼
Borax, crystals	Lb.	.. —.07¾
Boric Acid, powdered	Lb.	.. — .18
Bromine (technical)	Lb.	.. — .38
Calcium Carbide, car lots, f.o.b. works	Ton	.. —100.00
Calcium Carbide, ton lots, f.o.b. works	Ton	.. —105.00
Calcium Carbide, less than ton lots, f.o.b. works	Ton	.. —110.00
Calcium Chloride, fused	Per Ton	40.00—45.00
Calcium Chloride, flake	Ton	.. —48.00
Caustic Soda, ground, drum	Cwt.	6.50— 6.75
Caustic Soda, solid, drum	Cwt.	5.75— 6.00
Camphor Monobromate	Lb.	.. — 3.00
Carbon Bisulphide, in drums	100 Lb.	.. — .12
Carbon tetrachloride, drums	Lb.	.17— .19
Chalk, Precipitated	Lb.	.04¼— .06
China Clay, imported	Per Ton	30.00—35.00
Cobalt Oxide, black	Lb.	.. — 2.20
Cobalt Oxide, grey	Lb.	.. — 2.45
Copperas (Iron Sulphate) crystals	Lb.	.02¼—.02¼
Copperas (Iron Sulphate) sugar	Lb.	.02¼—.02¼
Copper Sulphate (Blue Vitriol)	Lb.	.07½—.08½
Corosive Sublimate (Mercuric Chloride)	Lb.	.. — .95
Fluorspar, ground	Tons	.. —30.00
Fuller's Earth, powdered	100 Lbs.	2.00— 2.50
Fuller's Earth, car lots, f.o.b. Toronto	Ton	35.00—40.00
Ferric Chloride, crystals	Lb.	.13—.14½
Ferric Chloride, solution	Lb.	.. — .12
Hydrofluoric Acid, 60%	Lb.	.. — .30
Hydrofluoric Acid, 30%	Lb.	.. — .14
Hydrochloric Acid, carboys, 18	100 Lbs.	2.25— 2.75
Hydrogen Peroxide	Gal.	.95— 1.00
Iodine, crude	Lb.	.. — 4.20
Iodine, resublimed	Lb.	.. — 4.75
Iron Oxide (red)	Lb.	.05— .13
Lead Acetate	Lb.	.14— .16
Lead Nitrate	Lb.	.15— .17
Lime, grey	Ton	.. —16.50
Lime, grey, in car lots	Ton	.. —14.00
Lime (hydrated) in ton lots	Ton	.. —23.25
Litharge	Lb.	.. — .10
Lithium Carbonate	Lb.	.. — 1.70
Lithopone	Lb.	.05½— .06
Magnesite, calcined	Per Ton	25.00—30.00
Magnesite, clinkered	Per Ton	.. —35.00
Magnesite, raw	Per Ton	.. —10.00
Magnesium Carbonate, bbl.	Lb.	.13— .16
Magnesium Sulphate	Lb.	.03½—.04¼
Mag. Sulphate, B.P., Medicinal...Single	Ton	70.00—75.00
Mag. Sulphate, Technical, car lots	Ton	55.00—60.00
Muriatic Acid, 18	100 Lb.	2.75— 3.00
Nickel Salt, single, in bbl. lots	Lb.	.. — .15
Nickel Salt, single, per cwt.	Lb.	.. —.16¼

Nickel Salt, double, in bbl. lots	Lb.	.. — .15
Nickel Salt, double, per cwt.	Lb.	.. —.16½
Nitric Acid, 36 carboys	100 Lb.	.09—.09¼
Phosphoric Acid, 85%	Lb.	.43— .50
Phosphoric Acid, 50%	Lb.	.29— .31
Phosphorus, yellow	Lb.	.. — .44
Potash Prussiate yellow	Lb.	.28— .30
Potassium Bicarbonate	Lb.	.. — .41
Potassium, Bromide, crystals	Lb.	.20— .27
Potassium, Bromide, granular	Lb.	.20— .27
Potassium Bichromate	Lb.	.. — .25
Potassium Chloride	Lb.	.. — ..
Potassium Carbonate, calc. 80%-85%	Lb.	.. — .08
Potassium Chlorate	Lb.	.. — .12
Potassium Citrate	Lb.	.. — 2.50
Potassium Hydroxide (Caustic Potash)	Sticks	.. — .80
Potassium Hydroxide (caustic potash) small drums	Lb.	.10— .15
Potassium Hydroxide (caustic potash) large drums	Lb.	.06½— .08
Potassium Iodide	Lb.	.. — 3.45
Potassium Nitrate, kegs	Lb.	.14— .16
Potassium Permanganate, bulk	Lb.	.65— .70
Red Precipitate (Mercuric Oxide)	Lb.	.. — 1.50
Silver Nitrate	Lb.	.. —10.00
Soda Ash, bags	Cwt.	2.90— 3.00
Sodium Acetate, ton lots or over	Lb.	.. — .06
Sodium Acetate, lesser amounts	Lb.	.. —.07½
Sodium Benzoate	Lb.	.65— .75
Sodium Bicarbonate, 100% pure	100 Lb.	3.00— 3.50
Sodium, Bichromate, bbls.	Lb.	.09— .11
Sodium Bisulphite, powder	Lb.	.. —.09½
Sodium Bisulphite, 35	Lb.	.05½— .06
Sodium Bromide (foreign)	Lb.	.25— .30
Sodium Cyanide, bulk, 98-99%, in cases	Lb.	.. —.26½
Sodium Hyposulphite, kegs	100 Lb.	5.50— 6.00
Sodium Iodide	Lb.	.. — 4.00
Sodium Nitrate, refined	100 Lbs.	7.00— 7.50
Sodium Nitrate, crude, 95%	100 Lbs.	5.00— 5.75
Sodium Nitrite	Lb.	.15— .16
Sodium Peroxide, f.o.b. New York	Lb.	.38— .40
Sodium Silicate, according to density	100 Lbs.	3.00— 3.50
Sodium Sulphate (Glauber's Salts) crystals	Per Cwt. in Bags	.. — 1.85
	Per Cwt. in Car Lots	.. — 1.75
Sodium Sulphite	Lb.	.. — .05
Sodium Prussiate, Yellow	Lb.	.16— .18
Sulphur, ground	100 Lb.	2.75— 3.25
Sulphur, roll	100 Lb.	4.50— 4.75
Sulphuric Acid, 66 Be, carboys	100 Lb.	2.25— 2.75
Sulphuric Acid, 66 Be, tank cars		.. —24.00
Talc, No. 1 grade	Ton	.. —30.00
Talc, No. 2 grade	Ton	.. —25.00
Talc, No. 3 grade	Ton	.. —18.00
Tin Chloride, crystals	Lb.	30 — .35
Tri-sodium Phosphate	Lb.	.08½— .09
Ultramarine, Blue	Lb.	.15— .35
White Precipitate (Mercuric-Ammonium Chloride)	Lb.	.. — 1.75
Whiting (English)	Ton	.. —35.00
Whiting (American)	Ton	.. —28.00
Whiting	Per Ton	35.00—40.00
Zinc Sulphate, com.	Lb.	.05¾—.06½
Zinc Dust	Lb.	.13—.14½
Zinc Oxide, lead free	Lb.	.9½—.10¼
Zinc Stearerate	Lb.	.. — .75

Organic.

Acetanilid, C. P.	Lb.	.. — .53
Acetic Acid, glacial, carboys, f.o.b. Shawinigan Falls	Lb.	.. —.22½
Acetic Acid, glacial, bbls., f.o.b. Shawinigan Falls	Lb.	.. — .22
Acetic Acid, 28%, carload lots	Lb.	.. —.04½
Acetic Acid, 28%, 25 bbl. lots	Lb.	.. —.05¼
Acetic Acid, 28%, 15 bbl. lots	Lb.	.. —.05½
Acetic Acid, 28%, 10 bbl. lots	Lb.	.. —.05¾
Acetic Acid, 28%, 6 bbl. lots	Cwt.	.. — 5.85
Acetic Acid, 28%, 3 or 4 bbl. lots	Cwt.	.. — 5.90
Acetic Acid 28%, 1 or 2 bbl. lots	Lb.	.. — .08
Acetic Acid, 80%, carload lots	Lb.	.. — .12
Acetic Acid, 80%, 25 bbl. lots	Lb.	.. — .14
Acetic Acid, 80%, 15 bbl. lots	Lb.	.. — .15
Acetic Acid, 80%, 10 bbl. lots	Lb.	.. —.15½
Acetic Acid, 80%, 5 bbl. lots	Lb.	.. — .16
Acetic Acid, 80%, 3 or 4 bbl. lots	Lb.	.. — .17
Acetic Acid, 80%, 1 or 2 bbl. lots	Lb.	.. —.17½
Acetone, pure, drums or over	Lb.	.. —.19½
Acetone, pure, lesser amounts	Lb.	.. — .25
Aspirin, in 100-lb. lots	Lb.	.85— .95
Alcohol, Absolute Ethyl, case of 1 doz 1-lb. bottle	1-lb. bottle	.. — 2.15
Alcohol, Absolute Ethyl, in steel drums of 10 gallons capacity	Imp. Gal.	.. —15.00
Alcohol, acetone, bbls. or over	Gal.	.. — 1.05
Alcohol, acetone, lesser amounts	Gal.	.. — 1.35
Alcohol, pure, bbl., 65% O.P.	Gal.	.. —10.50
Alcohol, methylated, bbl.	Gal.	.. — 3.50
Alcohol, wood, 95%, bbls. or over	Gal.	.. — 1.15
Alcohol, wood, 95%, half bbl. lots	Gal.	.. — 1.25
Alcohol, wood, 95%, lesser amounts	Gal.	.. — 1.30
Alcohol, wood, 97%, bbls.	Gal.	.. — 1.20
Alcohol, wood, 97%, half bbl. lots.	Gal.	.. — 1.35
Alcohol, wood, 97%, lesser amounts	Gal.	.. — 1.50
Amyl acetate, technical	Gal.	4.50— 5.00
Amyl acetate, pure	Gal.	5.50— 6.00
Benzaldehyde	Lb.	1.35— 1.60
Benzoic Acid	Lb.	.. — .90
Caffeine, English	Lb.	.. — 8.40
Calomel (Mercurous Chloride)	Lb.	.. — 1.40
Camphor, refined, slabs	Lb.	.. — 1.15
Camphor, refined, tal	Lb.	.. — 1.22
Carbolic Acid, white crystals	Lb.	.57— .75
Chloroform	Lb.	.55— .60
Citric Acid, domestic, crystals	Lb.	.65— .70
Coumarin	Lb.	.. — 5.75
Cream Tartar, 98%	Lb.	.25— .30
Dextrine, potato	Lb.	.. —.08½
Dextrine, corn	Lb.	.. —.08½
Ether, B.P. conc.)	Lb.	.. — .63
Ether, Sulphuric	Lb.	.30— .40
Formaldehyde, bbls. or over	Lb.	.. — .15
Formaldehyde, 200-lb. kegs	Lb.	.. —.19½
Formaldehyde, 100-lb. kegs	Lb.	.. —.20½
Formaldehyde, 50-lb. kegs	Lb.	.. —.21½
Formic Acid, 75%	Lb.	.40— .42
Fusel oil, special	Gal.	6.00— 5.25
Fusel oil, refined	Gal.	.. — 6.00
Gallic Acid	Lb.	1.25— 1.75
Glycerine, C.P., single tin of 56 lbs.	Lb.	.. — .27
Glycerine, C.P., two or more tins	Lb.	.. — .25
Glycerine (pale straw) single tin 56 lbs.	Lb.	.. — .26
Glycerine (pale straw) two or more tins	Lb.	.. — .24
Hexamethylenetetramine		1.10— 1.50
Oxalic Acid	Lb.	.14— .20
Oleic Acid	Lb.	.. — .24
Phenacetin	Lb.	3.10— 3.50
Phenolphthalein	Lb.	.. — 1.80
Pyrogallic Acid	Lb.	3.00— 3.50
Quinine	Oz.	1.00— 1.10
Saccharin	Lb.	3.50— 4.00
Salicylic Acid	Lb.	.. — .35
Starch, corn, ground, car lots	Lb.	.. —.04½
Starch, potato, ground, car lots	Lb.	.. —.07½
Stearic Acid, Double Pressed	Lb.	.17— .18
Stearic Acid, Triple Pressed	Lb.	.19— .20
Tartaric Acid, crystals or powdered	Lb.	.39— .44
Tannic Acid, commercial	Lb.	.45— .65

C. P. Chemicals.

Ammonia, C.P.	Lb.	.. — .27
Hydrochloric Acid, C.P.	Lb.	.. — .16
Nitric Acid, C.P.	Lb.	.. — .24
Sulphuric Acid, C.P.	Lb.	.. — .15

Industrial Gases.

Acetylene, cylinders	per 100 cu. ft.	2.55— 3.00
Coal Gas, cylinders	per 100 cu. ft.	3.00— 4.00
Hydrogen (cylinders)	per 100 cu. ft.	1.00— 1.60
Nitrogen, cylinders	100 cu. ft.	3.00— 4.00
Nitrogen, cylinders	per 100 cu. ft.	1.40— 2.50

Fertilizer Materials.

Acid Phosphate	Ton	.. —28.00
Animal Tankage, per unit of Ammonia		.. — 2.00
Animal Tankage, per unit of Bone Phosphate of lime		.. — .10
Nitrate of Soda	Ton	.. —67.00
Muriate of Potash	Ton	.. —60.00
Pure Ground Blood, per unit of Ammonia....		.. — 2.25
Steamed Bone Meal	Per Ton	.. —45.00
Sulphate of Ammonia	Ton	.. —65.00

Rubber.

The following quotations on rubber are in American funds, New York delivery:

Crude.

Para, upriver	Lb.	.. —.21¾
Caucho Ball, upriver	Lb.	.. — .12

Plantation Rubber.

1st Latex Crepe	Lb.	.. — .17
Smoked Sheet	Lb.	.. —.16½

Scrap Rubber.

Boots and shoes	Lb.	.04— .05
Automobile tires	Lb.	.. — .01
Steam and fire hose	Lb.	.. —.01¼
Inner tubes, No. 1	Lb.	.. — .08
Inner tubes, No. 2	Lb.	.. —.05¾

Tanning and Dyeing Materials

Fustic Crystals	Lb.	.28— .32
Hematine Crystals	Lb.	.20— .26
Logwood Crystals	Lb.	.20— [illegible]
Quercitron Liquid Extract	Lb.	.06¾—.07½
Liquid Sumac Extract	Lb.	.07½—.08½
Ground Sumac	Ton	60.00—65.00
Chestnut Liquid Extract	Lb.	.02¼—.02¾
Hemlock Liquid Extract	Lb.	.04½—.04¾
Quebracho Liquid Extract	Lb.	.03½—.03¾
Quebracho Solid Extract	Lb.	.05—.05½
Liquid Blended Extract (Canadian)	Lb.	.04—.04½

Waxes, Gums, Vegetable and Essential Oils.

Essential Oils—

Cedar, leaf	Lb.	.. — 2.00
Cedar, wood	Lb.	.. — 1.15
Camphor	Gal.	.. — 1.10
Camphor, white	Lb.	.. — 1.00
Peppermint, American	Lb.	.. — 3.00
Peppermint, re-distilled, B.P.	Lb.	.. — 3.25
Peppermint, Japanese	Lb.	.. — 1.50

Vegetable Oils—

Anise Oil	Lb.	.. — .80
Castor Oil (Medicinal), in bbl. lots	Lb.	.. — .21
Castor Oil (Commercial), in bbl. lots	Lb.	.. — .19
Castor Oil (Sulphonated)	Lb.	.15— .19
Cocoanut Oil (Refined)	Lb.	.14— .16
Corn Oil, in bbls.	Lb.	.. — .10
Corn Oil, tank cars	Lb.	.08—.08½
Cottonseed Oil, crude, f.o.b. Mississippi Valley points	Lb.	.. —.05¾
Cottonseed Oil, crude, f.o.b. Texas points	Lb.	.. —.05½
" Oil, summer yellow, f.o.b., Chicago	Lb.	.. — .07
" Oil, winter yellow, f.o.b. N.Y.	Lb.	.. — .08
Linseed Oil, raw, single bbls.	Imp. Gal.	.. — .84
Linseed Oil, raw, 3 to 5-bbl. lots	Imp. Gal.	.. — .83
Linseed Oil, raw, 6 to 9-bbl. lots	Imp. Gal.	.. — .81
Monopole Oil	Lb.	.. — .18
Olive Oil, foots, at Toronto	Lb.	.11½— .12

Gums—

Indian, No. 1A	Lb.	.. — .34
Indian, No. 1	Lb.	.. — .30
Tragacanth, No. 1, Ribbon	Lb.	.. — 4.00
Tragacanth, No. 1, Flake	Lb.	.. — 3.00
Tragacanth, Turkey	Lb.	.. — 2.90
Arabic, clear amber sorts	Lb.	.. — .18
Arabic, regular grain No. 4 and No. 5	Lb.	.. — .22
Arabic, regular grain No. 2	Lb.	.. —.22½
Arabic, white sorts	Lb.	.. — .40
Arabic, powdered, No. 1	Lb.	.. — .28
Arabic, powdered, No. 2	Lb.	.. — .27

Waxes—

Beeswax, various grades	Lb.	.39— .51
Paraffin, 128°—130°, M.P.	Lb.	.. — .22
Paraffin, 118°—120°, M.P.	Lb.	.. — .19
Paro Wax, blocks	Lb.	.. — .20
Shellac, T.N.	Lb.	.. — .84

Oils and Coal Tar Products.

Motor Gasoline	Gal.	.. —.32½
Motor Gasoline (service stations)	Gal.	.. —.36½
Lighting Gasoline	Gal.	.. —.37½
Naphtha	Gal.	.. —.31½
Coal Oil	Gal.	.. — .20
Fuel Oil, tank wagons	Gal.	.. — .10
Fuel Oil, tank cars	Gal.	.. — .09
Mid. Continent Crude (42 W. gal.)	Bbl.	.. — 1.50
Pennsylvania, crude (42 W. gal.)	Bbl.	.. — 3.50
Crude Creosote Oil, bbls.	Gal.	.. — .40
Refined Creosote Oil, bbls.	Gal.	.. — .55
Crude Coal Tar	Bbl.	.. — 9.25
Refined Coal Tar	Bbl.	.. —10.50
Coal Tar Pitch, bbls.	Cwt.	.. — 1.75
Benzol, pure	Gal.	.50— .65
Refined Solvent Naphtha	Gal.	.20— .25
Pure Toluol	Gal.	.52—. 57
Dip Oil, 20 per cent.	Gal.	.28— .46
Crude Carbolic Acid, 30 per cent.	Gal.	.. — .75
Naphthalin flake	Lb.	.. — .10
Naphthalin Balls	Lb.	.. — .1[illegible]
Alpha-Naphthylamin	Lb.	.. — .51

Flotation Oils and Naval Stores.

Rosin, Grade G, in 280 bbl. lots		.. — 9.00
Rosin, Grade W.W., in 280 bbl. lots		.. —10.00
Turpentine, spirits, single bbls.	Imp. Gal.	.. — 1.20
Turpentine, spirits, 2 to 4-bbl. lots	Imp. Gal.	.. — 1.19
Turpentine, spirits, 5-gal. container	Imp. Gal.	.. — 1.35

Metals.

Aluminium, No. 1, 98-99%	Lb.	.. — .28
Antimony	Lb.	.. —.07½
Brass, yellow ingots	Lb.	.. —.10½
Brass, red	Lb.	.. — .14
Cobalt, metal	Lb.	3.30— 3.50
Copper, electrolytic, small lots	Cwt.	.. —17.25
Copper, electrolytic, car lots	Cwt	.. —16.75
Copper, casting, small lots	Cwt.	.. —16.75
Copper, casting, car lots	Cwt.	.. —16.25
Gold, Pure	Oz.	23.00—25.00
Iron, Pig	Ton	.. —30.00
Lead, pig, small lots	Cwt.	.. — 6.70
Lead, pig, car lots	Cwt.	.. — 6.20
Magnesium, ribbon	Oz.	.. — 1.50
Magnesium, ribbon,	Lb.	.. —18.00
Magnesium, powder	Lb.	3.00— 3.50
Mercury	Lb.	1.10— 1.25
Monel Metal, shot	Lb.	.. — .41
Monel Metal, sheet, hot rolled, on orders of over a thousand lbs. of one gauge	Lb.	.. — .64
Monel Metal, Rods, hot rolled	Lb.	.. — .49
Monel Metal, rods, cold rolled	Lb.	.. — .66
Nickel, shot or ingot	Lb.	.. — .35
Platinum, pure	Oz.	85.00—90.00
Silver, bar, American silver	Oz.	.. —.99¼
Silver, bar, Canadian produced, U.S. funds	Oz.	.. —.68½
Steel, mild, ¼ inch, base price	Cwt.	.. — 3.25
Steel, mild, 3/16 inch, base price	Cwt.	.. — 3.75
Steel, nickel, in bars, 3½% nickel	Lb.	.. — .20
Steel Sheet, 28 guage, size 30"	Cwt.	.. — 6.10
Steel Sheet, 28 guage, size 36"	Cwt.	.. — 6.30
Tin	Lb.	.. — .38
Zinc, sheets	Lb.	.. — .15
Zinc (spelter) small lots	Cwt.	7.15— 7.20
Zinc (spelter) car lots	Cwt.	6.65— 6.70

BUYERS' GUIDE FOR C. P. TECHNICAL AND PHARMACEUTICAL CHEMICALS, DYES, APPARATUS, MACHINERY AND INDUSTRIAL PLANT EQUIPMENT. DIRECTORY OF LEADING ANALYTICAL LABORATORIES, CONSTRUCTION AND CHEMICAL ENGINEERS.*

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Acetic Acid—
Canadian Electro Products Co., Power Building, Montreal.
Standard Chemical Co., Montreal

Acetone and Acetates—
Standard Chemical Co., Montreal

Acids—Commercial—
Nichols Chemical Co., 222 St. James Street, Montreal. 126 Mill Street, Toronto.

Acid Plants—
General Ceramic Co., 50 Church Street, New York, N.Y.

Acids—Laboratory C.P.—
Canadian Laboratory Supplies Ltd., 615 Yonge Street, Toronto.
Lymans, Ltd., Montreal.
National Drug & Chemical Co., Ltd., Montreal.

Acid Proof Centrifugal Pumps—
G. H. Elmore, Colonial Trust Bldg., Philadelphia, Pa.

Acid Resisting Metal—
Hiram Walker & Sons Metal Products, Ltd., Walkerville, Ont.

Alkali—
Brunner, Mond Canada, Limited, Amherstburg, Ont.

Alcohol—Absolute Ethyl—
U.S. Industrial Chemical Co., 27 William Street, New York
Canadian Industrial Alcohol Co., Montreal, Canada

Alcohol—Ethyl or Grain—
Canadian Industrial Alcohol Co., Montreal.

Alcohol—Methyl or Wood—
Standard Chemical Co., Ltd., Toronto.

Alum, Paper Makers'—
Nichols Chemical Co., Toronto and Montreal

Alundum and Crystolon Refractories—
E. H. Sargent & Co., 155–165 East Superior St., Chicago, Ill.

Amyl Acetate—
Cosmos Chemical Co., Port Hope, Ont.

Ammonia—
Canadian Ammonia Co., Ltd., Toronto.

Analysts—
J. T. Donald & Co., 318 Lagauchetiere Street W., Montreal.
Thos. Heys & Sons, Toronto Arcade, Toronto
Stillwell Laboratories, 76½ Pine Street, New York.
L. J. Rogers, Chemical Laboratories, 64 John Street, Toronto.

Antimonial Sheets—
Hoyt Metal Co., Toronto.

Apparatus—Bacteriological—
Eimer & Amend, 3rd Ave., 18th to 19th Sts., New York, N.Y.
The Hughes Owens Co., Limited, 247 Notre Dame St. West, Montreal.

Apparatus—Chemical—
E. H. Sargent & Co., 155–165 East Superior St., Chicago, Ill.

Apparatus—Industrial—
Eimer & Amend, 3rd Ave., 18th to 19th Sts., New York, N.Y.
The Bristol Company, Waterbury, Conn.
A. H. Winter Joyner, Limited, Agents, Toronto and Montreal

Apparatus—Laboratory Supplies—
J. F. Hartz Co., 24 Hayter Street, Toronto.
Canadian Laboratory Supplies Ltd., 615 Yonge Street, Toronto.
Eimer & Amend, 3rd Avenue & 18th Street, New York.
Scientific Materials Co., Pittsburgh, Pa.
Lymans Limited, Montreal.
Topley Co., 132 Sparks Street, Ottawa.
George Taylor Hardware Ltd., Cobalt, Ont
E. H. Sargent & Co., 155 East Superior Street, Chicago, Ill.
A. Daigger & Co., 54 West Kinzie Street, Chicago.
Central Scientific Co., 460 East Ohio Street, Chicago.
The Hughes Owens Co., Limited, 247 Notre Dame St. West, Montreal.
Arthur H. Thomas Co., West Washington Sq., Philadelphia, Pa.

Apparatus—School and College Lab. Equipment—
McKay School Equipment, Ltd., 615 Yonge Street, Toronto.
Kewaunee Mfg. Co., Kewaunee, Wisconsin,
McKay School Equipment Co. Agents, Toronto,

Architects and Construction Engineers—
E. A. James Engineering Co., Excelsior Life Building, Toronto.

Arsenic—
Coniagas Reduction Co., St. Catharines, Ont.
Deloro Smelting & Refining Co., Deloro, Ont.

Babbitt Metal—
Hoyt Metal Co., Toronto.

Barrels—Steel—
Smart-Turner Machine Co., Hamilton, Ont.
W. D. Beath & Son, Ltd., Toronto.

Balances—Assay, Analytical and Chemical—
J. F. Hartz Co., Ltd., 24 Hayter Street, Toronto.
Lymans, Limited, Montreal.
Canadian Laboratory Supplies, Ltd., 615 Yonge Street, Toronto.
Wm. Ainsworth & Sons, The Precision Factory, Denver, Colo.
Arthur H. Thomas Co., West Washington Square, Philadelphia, Pa.
Christian Becker, Inc., 92 Reade St., New York, N.Y.
Central Scientific Co., 460 East Ohio St., Chicago

Bleaching Powder—
Canadian Salt Co., Windsor, Ont.

Books—Chemical and Scientific—
Westman Press, Ltd., 57 Queen St. West, Toronto.

Borax—
Imperial Trading Co., Montreal.
Winn & Holland, Ltd., 137 McGill St., Montreal.

Brimstone—
Union Sulphur Co., 17 Battery Place, New York, N.Y.

Carbide—
Canada Carbide Co., Power Building, Montreal.

Carbon—Decolorizing and Deodorizing—
Industrial Chemical Co., Fifth Avenue Bldg., New York, N.Y.

Centrifuges—
Thos. Broadbent & Sons, Ltd., Huddersfield, England.

Charcoal—
Standard Chemical Co., Royal Bank Building, Toronto.

Cobalt and Cobalt Compounds—
Coniagas Reduction Co., St. Catharines, Ont.
Deloro Smelting & Refining Co., Deloro, Ont.

Chemicals—Industrial—
Powers-Weightman-Rosengarten Co., 16 Place Royale, Montreal.

Chemicals—Industrial—
Nichols Chemical Co., Ltd., Toronto and Montreal.
T. E. O'Reilly, Limited, 608 Excelsior Life Building, Toronto.
J. W. Leitch & Co., Huddersfield, England.
W. T. Bruce & Co., 3 Lombard Court, London, E.C., 3, Eng.
Wilson, Paterson, Gifford Co., Board of Trade Building, Montreal.
Standard Chemical Co., Montreal
Winn & Holland, Ltd., Montreal.
Mallinckrodt Chemical Works, Ltd., Montreal, Que.
Imperial Trading Co., Montreal.

Chemicals—C.P. and Laboratory—
Merck & Co., 28 St. Sulpice St., Montreal.
Scientific Materials Co., Pittsburgh, Pa.
Eimer and Amend, 3rd Ave. & 18th St., New York, N.Y.
A. Daigger & Co., 54 West Kinzie St., Chicago, Ill.
E. H. Sargent & Co., 155–165 East Superior St., Chicago, Ill.
J. T. Baker Chemical Co., Phillipsburg, N.J.
Central Scientific Co., 460 East Ohio St., Chicago, Ill.
Monsanto Chemical Works, St. Louis, Mo., and Toronto.
U.S. Industrial Chemical Co. 27 William St., New York, N.Y.

Chemicals—Pharmaceutical—
National Drug & Chemical Co., Montreal, Toronto, Halifax, Winnipeg and Vancouver
Lymans Limited, Montreal.
Monsanto Chemical Works, St. Louis, New York, U.S.A., London, Eng.
F. E. Cornell & Co., 16 Place Royale, Montreal.

Colorimeters—
Canadian Laboratory Supplies, Ltd., 615 Yonge St., Toronto

Compressed and Dissolved Gases—
Prest-O-Lite Company of Canada, Prest-O-Lite Bldg., Toronto.

Coppersmiths—
The Booth-Coulter Copper & Brass Co., Toronto, Ont.

Copper Sulphate—
The Coniagas Reduction Co. Ltd., St. Catharines, Ont.

Disinfectants and Flotation Oils—
Hamilton Tar & Ammonia Co., Ltd., Hamilton, Canada

Disintegrators—
J. Harrison Carter, Ltd., Dunstable, Eng.

Dyes and Textile Colors—
A. Klipstein & Co. Ltd. 12 St. Peter St., Montreal
T. E. O'Reilly, Limited, 608 Excelsior Life Building, Toronto.
National Aniline & Chemical Co., 14 Front Street, East, Toronto. 8 Place Youville, Montreal.
Williams Bros. & Co., Hounslow, England

Dyes and Textile Colors (Made in Canada)
Canadian Dyes, Limited, Trenton, Ont.

rums—Steel—
W. D. Beath & Son, Ltd. 394 Symington Ave., Toronto.

Dryers—
Buffalo Foundry & Machine Co., 23 Winchester Ave., Buffalo, N.Y.

Drying Ovens—Electric—
J. F. Hartz Co. Ltd., 24 Hayter St., Toronto
Central Scientific Co., 460 East Ohio St., Chicago

Electric Furnaces—
Canadian Westinghouse Co., Hamilton.

* Advertisers using space in the regular advertising pages of the Journal will be listed under 5 or less headings free, according to position and space used.

BUYERS' GUIDE—*Continued from page 43.*

Electric Generators—
Canadian Westinghouse Co., Hamilton.

Electric Motors and Switchboards—
Canadian Westinghouse Co., Hamilton.

Electrical Instruments—
Central Scientific Co., 460 East Ohio St., Chicago

Engineers—Chemical & Consulting—
Dominion Engineering & Inspection Co. 320 Lagauchetiere Street W., Montreal
J. T. Donald & Co., Montreal.
L. J. Rogers, 64 John Street, Toronto
Thos. Heys & Sons, Toronto Arcade, Toronto.

Evaporators—
Buffalo Foundry & Machine Co., 1613 Fillmore Ave., Buffalo, N.Y.

Filtermass—
H. Reeve Angel & Co., 7-11 Spruce St., New York.

Filter Paper—
E. H. Sargent & Co., 155-165 East Superior St., Chicago, Ill.
H. Reeve Angel & Co., 7-11 Spruce St., New York.
Eimer and Amend, 3rd Ave. & 18th St., New York, N.Y.
Scientific Materials Co., Pittsburgh, Pa.
Central Scientific Co., 460 East Ohin St., Chicago, Ill.
Lymans, Limited, Montreal.
Evans, Adlard Co., Limited, Postlip Mills, Winchcombe, R.S.O., Glos., Eng.
Palo Company, 90-94 Maiden Lane, New York, N.Y.

Fittings (Cast and Malleable Iron)—
Crane, Limited, Montreal, Que.

Flanged Fittings (Cast Steel)—
Crane, Limited, Montreal, Que.

Glycerine—
Lever Bros., Toronto.
Adams Chemical Company, 27 St. Sacrament St., Montreal

Glassware—Chemical—
E. H. Sargent & Co. 155-165 East Superior St., Chicago, Ill.
Pfaudler Co., Rochester, N.Y.
Central Scientific Co., 460 East Ohio St., Chicago, Ill.
Eimer and Amend, 3rd Ave. & 18th St., New York, N.Y.
Scientific Materials Co., Pittsburgh, Pa.
The Hughes Owens Co. Ltd., 247 Notre Dame St. West, Montreal

Glass Wool—
H. Reeve Angel & Co., 7-11 Spruce St., New York.

Green Copperas—
W. T. Scales & Co., Ltd., Cleveland Works, Birkenhead, England.

Impregnating and Solvent Recovery Apparatus—
Buffalo Foundry and Machine Co. Buffalo, N.Y.

Iodine (Distilled)—
U.S. Industrial Chemical Co. 27 William St., New York, N.Y.

Kettles—Steam Jacketed—
Sowers Manufacturing Co., 1315 Niagara Street, Buflalo, N.Y.
The Booth-Coulter Copper & Brass Co., Toronto, Ont.

Laboratory Furniture—
Kewaunee Mfg. Co., Kewaunee, Wisconsin.
McKay School Equipment Co., Agents, Toronto

Labruco Tubing, Pure Gum Rubber—
H. Reeve Angel & Co., 7-11 Spruce St., New York.

Lead Burning—
A. Mahony, 516 Wellingtoo St. W., Toronto, Ont.

Machinery—Electrical & Power Plant
Canadian Westinghouse Co., Hamilton, Ont.

Machinery—Pumping—
Smart-Turner Machine Co., Hamilton, Ont.

Machinery—Grinding
J. Harrison Carter, Ltd., 12 Mark Lane, Dunstable, London, Eng.

Machinery—Elevating & Conveying—
Canadian Link-Belt Co., Wellington and Peter Streets, Toronto.

Machinery—Mixing—
Sowers Manufacturing Co., 1315 Niagara St., Buffalo, N.Y.

Magnesium Carbonate—
A. Klipstein & Co. Ltd., 12 St. Peter Street, Montreal

Melting and Soldering Apparatus—
Prest-O-Lite Company of Canada, Prest-O-Lite Bldg., Toronto.

Mineral Resources—
Ontario Bureau of Mines, Parliament Buildings, Toronto.
Canadian National Railways, Resources Department, Toronto.
Canadian Pacific Railway, Dept. of Colonization and Development, Windsor Station, Montreal

Monel Metal—(Shot, Rod, Wire and Sheet)—
International Nickel Company of Canada, Harbor Commission Bldg., Toronto

Nickel Oxide—
Coniagas Reduction Co., Ltd., St. Catharines, Ont.
International Nickel Company of Canada, Harbor Commission Bldg., Torodto

Nickel—Salts
Deloro Smelting & Refining Co., Deloro, Ont.
International Nickel Company of Canada, Harbor Commission Bldg., Toronto

Nickel—Metal and Alloys—
Hiram Walker & Sons Metal Products, Walkerville, Ont.
International Nickel Company of Canada, Harbor Commission Bldg., Toronto
The Coniagas Reduction Co., Ltd., St. Catharines, Ont.

Paints—Acid Proof—
Dominion Paint Works, Ltd., Walkerville, Ontario

Paints, Varnishes for Industrial Construction—
Dominion Paint Works, Ltd., Walkerville, Ontario.

Paper Trade Specialties—
Nichols Chemical Co., Toronto and Montreal.

Paraldehyde—
Canadian Electro Pjoducts Co., Power Bldg., Montreal

Perforated Metals—
Canada Wire and Iron Goods Co., 182-186 King William Street, Hamilton, Can.

Phenols—
Dominion Tar & Chemical Co., 171 St. James St., Montreal.

Pipes and Fittings—Metal Lined—
Hoyt Metal Co., Toronto

Platinum—
Canadian Laboratory Supplies, Ltd., 615 Yonge Street, Toronto.

Porcelain—Chemical—
Coors Porcelain Co., Golden, Colo.

Porcelain—Scientific—
Coors Porcelain Co., Golden, Colo.

Potassium Salts (Nitrate, Sulphate, Chloride)—
Nichols Chemical Co. Ltd., Toronto.

Pressure and Vacuum Gauges—
The Bristol Company, Waterbury, Conn.
A. H. Winter Joyner, Ltd., Agents, Toronto and Montreal.

BUYERS' GUIDE—*Continued from page 45.*

Reagent Chemicals—
Merck & Co., 28 St. Sulpice St., Montreal
J. T. Baker Chemical Co., Phillipsburg, N.J.

Recording Instruments for Industries
The Bristol Company
A. H. Winter Joyner, Limited, Agents, Toronto and Montreal.

Rubber Tubing, Pure Gum—
H. Reeve Angel & Co., 7-11 Spruce St., New York.

Salt—
Canada Salt Co., Ltd., Windsor, Ont.

Soda Ash—
Brunner, Mnnd Canada, Ltd., Amherstburg, Ont.

Sodium Sulphate (Glauber's Salt)—
Nichols Chemicals Co., Toronto.

Stains—
Williams Bros. & Co., Hounslow, England

Stoneware—Acid-proof Chemical—
General Ceramics Co., 50 Church St., New York
Maurice A. Knight, East Akron, Ohio.

Sulphate of Alumina—
W. T. Scales & Co., Ltd., Cleveland Works, Birkenhead, England.

Sugar Plant Apparatus—
Buffalo Foundry and Machine Co., 1613 Fillmore Ave., Buffalo, N.Y.

Sulphur—
Union Sulphur Co., 17 Battery Place, New York City.

Tanks—
Ontario Wind Engine & Pump Co., Ltd. Atlantic Ave., Toronto, Ont.

Tanks—New and Used—
The Curtiss-Willis Co. Inc., 30 Church St., New York

Tar Products—
Dominion Tar & Chemical Co., 171 St. James St., Montreal.

Textile Gum for Printing—
Jacques Wolf & Co., Passaic, New Jersey.

Vacuum Drying Apparatus—
Buffalo Foundry and Machine Co., Buffalo, N.Y.

Vacuum Evaporating Apparatus—
Buffalo Foundry & Machine Co., 1613 Fillmore Ave., Buffalo, N.Y.

Vacuum Pans—
Sowers Manufacturing Co., 1315 Niagara Street, Buffalo, N.Y
The Booth-Coulter Copper & Brass Co., Toronto, Ont.

Va uum Pumps—
Central Scientific Co., 460 East Ohio St., Chicago

Valves—Acid Proof—
Hoyt Metal Co., Toronto.

Valves, Fittings, Pipings Equipment—
Crane, Limited, Montreal, Que.

Valves (Brass, Iron and Steel)—
Crane, Limited, Montreal, Que.

Welding Apparatus—
Prest-O-Lite Company of Canada, Prest-O-Lite Bldg., Toronto.

Whatman Filter Papers—
H. Reeve Angel & Co., 7-11 Spruce St., New York.

Wood Preservatives—
Dominion Tar & Chemical Co., 171 St James St., Montreal.

Zinc Oxide—
Watts Chemical Co., 80 Don Esplanade, Toronto, O .

Classified Advertisements

POSITION WANTED.

As understudy in any special line which will lead to a good permanent position by Chemist—graduate with executive ability and a good training in Mechanical and Electrical Engineering. Here is an opportunity to secure a good live wire with exceptional talent. Box 28, Canadian Chemistry and Metallurgy.

BALANCE WANTED.

A second hand analytical balance wanted, in good condition and reasonably accurate. State price. Box 35, Canadian Chemistry and Metallurgy.

PROFESSIONAL DIRECTORY

Those Who Advertise